

HARNESSING THE POWER OF PEOPLE AND PLACES:
A Comparative Evaluation of University Energy Dashboard Interface Designs

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For my family.

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1. INTRODUCTION

1.1 Introduction

Energy dashboards are new and emerging environmental tools, but little research has been done to evaluate user-fit between them and their intended audience. The aim of this project is to evaluate how effectively two distinct energy dashboards promote understanding of energy-use patterns among university students. The dashboard treatments consist of the Alerton Energy Dashboard (employed by the Human Ecology Building) and the Lucid Dashboard (employed by Cornell University campus buildings). This between-subjects, comparative-case study has two objectives. First, to assess how effectively users retrieve information from each energy dashboard and to identify usability issues and provide recommendations for improving the dashboard's content, aesthetics, navigation and utility. Second, to understand how the dashboards build upon participants' 'sustainable knowledge'. A total of sixteen graduate and undergraduate student volunteers were recruited and randomly assigned to one of the two dashboard treatments. A total of six outcome measures were collected. Specifically, four quantitative outcome measures were gathered: time, mouse clicks, successfully vs. unsuccessfully completed tasks and number of questions left unanswered. Additionally, two qualitative outcome measures were also collected: usability issues and the dashboard's ability to build on existing 'sustainable

knowledge'. Future research should measure the dashboard's influence on environmental attitudes and pro-environmental behavior.

1.1.1 Project's Significance

The American public underestimates the critical role that heating and cooling our country's buildings can play in reducing our collective energy footprint. This sector, however, represents a large part of our total energy consumption. According to the U.S. Energy Information Administration, three-fourths of US "electrical energy" is used to power, heat, and cool our buildings. (EIA, 2011) Scientific evidence shows that these building practices are unsustainable and represent a major threat to our environment. (EPA, 2013) Universities throughout the United States have acknowledged their responsibility in rethinking energy management strategies throughout their campuses. To date, 673 institutions have signed the American College & University President's Climate Commitment. This pledge obliges signatories to develop a comprehensive climate action plan and make sustainability part of all students' educational experience. (Presidents' Climate Commitment, 2013) The President's Climate Commitment recognizes the importance of educating students about university efforts to reduce greenhouse gas emissions.

An Energy Dashboard is a digital interface that organizes and presents building energy consumption information in a way that is easy to read and can be accessed remotely via a web-based platform. (Lucid Systems, 2012) This tool has the potential to become a device which aligns occupant behavior with opportunities for energy-conservation within buildings, since its primary purpose is to educate users about building-energy consumption trends and their environmental consequences. As part of

the campus' sustainability education and outreach efforts, Cornell plans to launch a campus-wide energy dashboard to raise awareness about energy consumption in buildings among the campus community. This university-wide dashboard will display real-time energy consumption information for over 50 campus buildings. (Cornell Chronicle, 2013) Cornell's Outreach Coordinator noted that there are many "energy-dashboards" to choose from on the market whose interfaces and the features they offer vary significantly. (Cornell Sustainability Outreach Coordinator, 2013) Yet, little research evaluates how effectively these different dashboards communicate energy consumption data to a wide range of potential student users and classroom audiences.

To date, no studies have been found that investigate the product-user fit between university energy dashboards and their intended audience. Consequently, this project was designed to address this absence through a comparative study of two different energy dashboards representing two different approaches used by universities to convey energy consumption in buildings. The goal of this study is to understand if there are significant differences between the level of effort (mouse clicks), comprehension time (time to complete a task) and efficacy (success or failure) in answering a question across the dashboard design treatment (Alerton Energy Dashboard & Lucid Dashboard). Usability issues collected from the task analysis can be used to improve the design of these two existing energy dashboards. The resulting design recommendations will be shared with the Cornell Office of Energy Sustainability to guide future energy dashboard acquisitions. These recommendations are also meant to impact design decisions related to this environmental education tool in other university campuses.

This introduction contains four sections as follow: first, review the current state of world climate change; second; outline the role of U.S. and N.Y. state policies in minimizing climate emissions and; third, explain comprehensive actions taken by Cornell University to reduce carbon dioxide emissions. Finally, the researcher outlines the project's intended academic contribution and its relevance to the Cornell campus community.

1.1.2 World Climate Change

A strong, credible body of evidence supports the fact that human behavior, specifically the burning of carbon-based fuels, is responsible for global climate change (WMO, 2013). One such indicator is the percent increase of greenhouse gasses in our atmosphere since the pre-industrial era to this day. Concentrations of carbon dioxide, methane and nitrous oxide GHGs in our atmosphere have increased, respectively, 140%, 259% and 120% (since 1760 to the present day). (WMO, 2013) According to UNEP (2012), “carbon dioxide is the single most important greenhouse gas emitted by human activity”. At 390.9 parts per billion, we have greatly surpassed, ‘the highest safe level of CO₂ in our atmosphere’, established by leading climate scientists as 350 parts per billion. (Steffen, 2006).

The worst-case scenarios predicted by climate-change models align with observed extreme weather events (IPCC, 2007). The greenhouse effect is a direct consequence of the accumulation of greenhouse gases, and is responsible for the rise in global temperature, acidification of oceans, receding of glaciers, higher sea levels, and erratic climactic changes (WMO, 2013). In the past century, average global temperatures have risen 0.6C (1.1F). By 2100, these temperatures are expected to

increase at least twice as much as they have in the last 100 years. (EPA, 2013) While these changes might seem manageable today, they represent irreparable damages to local ecosystems. Unless we take policy action to eliminate practices that produce them, these damages are predicted to compound exponentially. It is important to realize that individual actions do play a significant role in reducing greenhouse emissions. Raising public awareness is the first step. In the long-term, however, comprehensive government policy and industry-led initiatives are necessary to propel us toward more sustainable energy practices.

The United States has been one of two top primary energy-consuming countries in the world for the past decade. In 2013, the United States demanded 18% of the world's total energy consumption (100.8 Quadrillion BTU). The US was rivaled only by China, demanding 20% of primary world energy (114.7 Quadrillion BTU). In comparison, all OECD of Europe represented only 15% demand the world's primary energy consumption (EIA, 2011). The United States has the 10th highest per capita emissions in the world as compared to China (92nd highest) and the European Union (48 highest). (NRDC, 2013) These figures point out the reality that, the United States supports some of the most unsustainable energy-use practices in the world. While heating and cooling technologies have become increasingly efficient, energy demand has also increased. For instance, the size of an average American home is 30% larger as compared to those built prior to 2000. (EIA, 2013) This statement emphasizes the reality that sustainable energy use patterns cannot arise from technological innovation alone. We must create platforms for educating consumers about the implications of

their resource use. This energy dashboard study is one humble attempt to help consumers better understand resource use.

1.1.3 The United States' Role

In December 2009, President Obama and leaders from 24 countries, representing eighty percent of global emissions drafted the Copenhagen Accord. The accord emphasizes the importance of carbon emissions benchmarking, transparency and accountability. Here, the United States publically committed to ‘reduce emissions by 17, 42 and 83 percent by 2020, 2030, and 2050, respectively (as compared to 2005 levels)’. (NRDC, 2013) Subsequently, the House of Representatives passed energy and climate legislation in support of these goals. (NRDC, 2013) Compared to national policy, city-level legislation has set and met the most aggressive policy goals. Renovating city infrastructure has been main target of these city-legislative actions. (PlanNYC, 2013)

GreenPlanNYC is perhaps the most notable, recently-enacted, city plan to reduce carbon emissions. GreenPlanNYC is a city-wide effort enacted by Mayor Bloomberg to update existing infrastructure, increase energy efficiency, improve the standard of living and support future population growth in the City of New York (PlanNYC, 2013). Today, buildings are more widely recognized as a powerful sector that can help reduce greenhouse emissions. According to the Energy Information Agency, residential and commercial buildings represent forty-one percent of the total energy demand in the United States and consume seventy-four percent of the electricity generated – this figure does not include energy use in industrial office buildings. (Kats, Braman & James, 2010)

Green Plan NYC launched three major legislative efforts to improve energy efficiency in existing buildings. These laws target municipal buildings, small renovations and large existing buildings. The most progressive piece of legislation is Local Law 88. This law ‘mandates that buildings of 50,000 gross square feet or larger undergo energy audits and retro-commissioning’ every ten years. Retro-commissioning is the professional assessment of a building’s energy performance. Local Law 88 also requires large non-residential buildings to install electrical sub-meters for each large non-residential tenant space (Local Law 88, 2009). Currently many multi-tenant buildings have only a single meter tracking the entire building’s energy use. Therefore, building tenants are often unaware of their personal energy consumption (Local Law 88, 2009). Local Law 88 also requires landlords to provide tenants with personal energy-metering statements on a monthly basis. Sub-metering and personal energy-use statements encourage energy savings and behavior change among users. Individual metering makes it more likely that landlords turn utility costs over to the tenant. As a result, tenants become fiscally aware of their personal energy consumption and are more likely to prioritize energy efficiency when making lease-related decisions. This legislation recognizes the role of building design and of individual behavior in driving down energy demand.

To meet Green Plan NYC’s goal of eliminating thirty percent of all municipal departments’ emissions by 2017 (as compared to 2005 standards), Local Law 86 requires municipal buildings to abide by Leadership in Energy and Environmental Design (LEED) Silver standards. (PlanNYC, 2013) LEED is a consensus-based, third party certification process that has set a national standard for green building practices.

(USGBC, 2013) Strong support for LEED certified building standards, has come not only from Green Plan NYC, but also from national legislative mandates, tax incentives and industry drivers. (Parfomak, Sissine & Fischer, 2009) The newest version of this point-based system, LEED version 4.0, places increased emphasis on energy performance and ‘smart’ metering. (Sennatt, 2013) A growing number of energy-related credits hinge on ‘smart’ meters, which help identify areas for improved energy efficiency. For instance, Advanced Energy Metering (Pilot Credit 26) and Demand Response (Pilot Credit 8), require smart’ metering systems. Other ‘Energy and Atmosphere’ credits facilitated by ‘smart’ meters include: Fundamental Commissioning of Building System (EA Prerequisite 1), Minimum Energy Performance (EA Prerequisite 2), Optimize Energy Performance (EA Credit 1) and Measurement & Verification (EA Credit 5). Additional metering related credits are: On-Site Renewable Energy (EA-2), Enhanced Commissioning (EA-3), and Green Power (EA-6). (USGBC, 2013) Due this emphasis on smart’ metering, energy dashboards are likely to experience a boom in demand, resulting in a culture of increased energy awareness.

Conservation tools such as the ‘energy dashboard’ help educate citizens about energy consumption in buildings and communicate avenues for personal energy savings. As evidenced by GreenPlan NYC, user-engagement and education is just as important as the legislative actions themselves. As ‘smart’ metering practices gain momentum, energy dashboards represent an opportunity to educate occupants about energy conservation efforts through real-time feedback.

1.1.4 Cornell University's Role

Since its inception in 1865, Cornell's academic mission revolves around leadership, outreach and a commitment to disseminate knowledge for the improvement of lives throughout the local community, in the state and ultimately, throughout the world. Recognizing the impact of its own carbon emissions, in 2007 Cornell made a public commitment to become a net-zero carbon neutral campus, by 2050. Today, Cornell has pledged to become a 'living laboratory' for sustainability's environmental, economic and social dimensions. (Cornell CAP, 2011). Cornell is uniquely positioned to take on this leadership role due to its long-term-commitment and vision. Furthermore, the university can look to faculty, staff and student-leaders for expertise across a multitude of academic disciplines.

In response to this net-zero pledge, the Climate Action Plan (CAP) was released in 2009. This plan details how to eliminate all green-house gas emissions required to power, heat and cool Cornell's campus by 2050. (Cornell CAP, 2011) This plan recognizes that the solution is multi-faceted and emphasizes the following five components: 1) fuel mix and renewables, 2) green development actions, 3) energy conservation actions, 4) alternative transportation, and 5) offsetting actions.

Significant progress has been made in the 'fuel mix and renewables' sector toward reducing Cornell's greenhouse gas emissions. For example, in March 2011 Cornell University eliminated its use of coal by converting natural gas into its primary source for energy. This change reduced carbon emissions by twenty five percent. (C.U. Sustainable Campus, 2013) Today, the Combined Heat & Power plant meets

campus energy demands with a reduced environmental impact. Furthermore, ongoing research assesses other alternative energy sources including geothermal, hydroelectric and biomass technologies. (Cornell CAP, 2011) While converting to more efficient energy sources has proven impactful, it is also necessary to reduce the energy demand of our campus infrastructure through ‘green development’ and ‘energy conservation’ actions.

Many policies have been put in place to prevent the need for future construction. First, a re-evaluation of current space use practices has gone into effect. More efficient space-use frees up unused space, decreases operating costs and reduces demand for new building construction. Second, effective land-use practices enable a more compact campus footprint while preserving natural land and resources. (Cornell CAP, 2011) Increased density also reduces the energy demand associated with transportation, new construction and utility costs. In addition to efficient space planning policies, stricter construction standards and facility management policies also reflect the crucial role of buildings in reducing campus-wide GHG emissions.

All construction and renovation projects have become subject to stringent building standards. Construction and renovations (with a cost of over five million dollars) are required to achieve thirty percent energy reduction compared to baseline energy code ASHRAE 90 and support LEED silver-certification policies (Cornell CAP, 2011). In order to meet these energy reduction standards, smart” energy meters have been installed in buildings associated with the Energy Conservation Initiative (ECI). Additional upgrades include building weatherization initiatives, reduced ventilation rates, plug-load reduction efforts in offices and laboratories and campus-

wide energy outreach and awareness. (C.U. Energy Management, 2013) These investments highlight the role of building infrastructure in reducing GHG emissions.

While the Cornell Action Plan has taken considerable ‘energy conservation actions’ it has lagged behind in its efforts to promote environmental education and outreach. Educating the student body to think critically about their resource use practices, including energy, is one way to reduce greenhouse emissions. Environmental education is extremely important because students are part of the campus for four years. During this time, students represent the primary users of all campus’ resources. Therefore, their cumulative actions play a significant role in energy conservation. Furthermore, universities represent a formative educational environment. The ‘ethos’ this environment cultivates is carried by students throughout their lives. Education has the potential to effect lasting change. As Cornell moves toward a goal of net-zero emissions, the energy dashboard can be seen as part of a greater network of coordinated outreach actions. Behavior-change cannot result from the availability of this tool alone but dashboards can contribute to improving environmental education within the campus community.

1.1.5 Academic Contribution

An undergraduate concentration in Interior Design in the Department of Design and Environmental Analysis afforded the researcher a strong understanding of sustainable design building practices and energy efficient management standards. This background brought to light the reality that most building occupants also have little awareness of how much energy is required to run the spaces they inhabit. This is because energy is an intangible resource, making it difficult for people to visualize the

negative consequences of its over-consumption. However, energy can be made more tangible is by explaining its role in operating a physical space. According to the information deficit model, better information will result in better building usage habits (Wilson & Dowalatabadi, 2007). Based on the information deficit model, explaining how buildings function allows people to understand their role in effecting positive change, making occupants more likely to act. (Wilson & Dowalatabadi, 2007)

Once energy use in buildings is de-mystified, benchmarks for high vs. low energy use and recommendations for conserving energy will make much more sense to a user. Occupants can use this understanding to inform energy-related decisions regarding their personal spaces (i.e.dorms or apartments). The dashboard can further facilitate these decisions by providing a section with recommendations about ways to reduce energy use in dorms & apartments. For more expert users, an alternate dashboard design can provide a greater level of detail and opportunities for exploration. Today, Cornell has over four hundred buildings, ranging in age, building archetype, construction materials & and end-use. Construction and material-technologies change rapidly; therefore, it is important to understand how energy-use varies across these building variables. These diverse buildings provide the perfect living laboratory for design/architecture & facility management students to understand which designs & construction materials yield greater energy efficiency.

The Human Ecology Building's (Alerton) energy dashboard represents Cornell's first pioneering effort to educate students about building energy-use. As a LEED Platinum certified building, this building embodies many of the principles outlined by the Cornell Climate Action Plan. The dashboard's goal is to increase

students' knowledge of energy-use in buildings and, ultimately, to promote sustainable behavior. This investigation evaluates how well the dashboard currently operates as an environmental education intervention. The resulting recommendations are intended to provide ways to improve the existing energy dashboards' product-user fit. These recommendations will be shared with Cornell University's Department of Energy and Sustainability and with the developers of the Alerton and Lucid Energy Dashboards. The aim of these design recommendations is to influence Cornell University's future environmental education interventions. Further investigation and research are needed to investigate the impact of the energy dashboard on behavior change.

2. THEORETICAL FRAMEWORK/ LITERATURE REVIEW

This study investigates the elements of two web-based energy dashboards that support or inhibit effective navigation and the ability to retrieve information provided on the dashboard in an intuitive and educational manner. The ultimate goal of this project is to create an environmental education (EE) intervention that communicates energy savings to university students in a more effective way than energy dashboards designed for a more technical audience.

To identify a theoretical framework and develop a methodological approach, a literature review was conducted within three major fields. The first section of the review addresses environmental attitudes and behavioral research theory. This investigation clarifies the relationship between EE (interventions) and pro-environmental behaviors. Although, environmental attitudes and behavior are not measured by this study, such findings build a conceptual framework to evaluate energy dashboards' content. A brief discussion explains how each behavioral theory will shape the content of an energy dashboard.

The second section of this literature review highlights important studies that investigate electricity consumption feedback (ECF), otherwise known as building energy monitoring, in promoting pro-environmental attitudes and sustainable behavior. This section also identifies current gaps and opportunities for further investigation in the field of ECF.

Finally, the third section of this review addresses existing protocols for website navigation to help develop an appropriate methodology for this study. The section focuses on studies from website analysis and reviews the methodological approaches employed by Card (2001), Dumas and Redish (1999) and Rubin (1994).

2.1 Part One: Environmental Attitudes & Behavioral Theory

In this section, *environmental attitudes* and five behavioral theories are explained. While the relationship between knowledge and pro-environmental behavior is not always linear, several behavioral theories explain possible mediators. To make the dashboard a more effective environmental education intervention, behavioral theory provides insight into the dashboards' necessary content and design objectives.

Although the aim of this study is not to measure the behavioral impact of each energy dashboard, an effective EE interventions' design must also support pro-environmental behavior in addition to providing data about building resource use. First, to develop precedent of successful EE interventions we conduct an investigation of existing environmental attitudes and popular EE interventions. Next, a review of five behavioral theories is used to develop a framework and to determine the possible behavioral impact that each energy dashboard has. The five behavioral theories include: rational choice theory, Ajzen's planned behavior theory, goal-setting theory, incentive theory and self-determination theory. Finally, insights derived from these theories are incorporated into the 'recommendations' section as a way to evaluate the two dashboards' potential in stimulating pro-environmental behavior.

Environmental Attitudes

Environmental attitudes are one way to measure people's values and beliefs about the environment. Gifford (2007) defines environmental attitudes as: individuals' concern for the physical environment as something that is worthy of protection, understanding or enhancement (Gifford, 2007). Despite the fact that environmental attitudes do not always result in pro-environmental actions, they are sought as reliable way to gauge civic support for future pro-environmental initiatives.

Today, three components of an environmental attitude have been established. These include the cognitive component, the affective component and the conative (behavioral) component. The cognitive component refers to what an individual knows or thinks about the attitude object. The affective component includes one's emotions and feelings about the environment. The behavioral component encompasses an individual's behavioral intentions toward an environment. (Bonnes, 2004) These three, independent components of environmental attitudes highlight the importance of multi-faceted EE design approach.

Environmental Education (EE) Interventions

In this section, a broad overview of EE interventions and their findings is conducted. Evaluating popular EE interventions provides insight into the successful components of EE interventions. A brief section at the end

summarizes the ‘lessons learned’ from this review and points out opportunities for further research in the field. The most common form of EE research compares traditional education programs to innovative strategies for EE in fostering pro-environmental attitudes. For example, one popular EE strategy to increase environmental concern involves outdoor-immersion education programs. Kossack (2012) conducted a study that compared traditional environmental education workshop (indoors) to an outdoor exploration program (wooded area). While many variables were held constant, this study found that the outdoor exploration program was more successful at increasing environmental attitudes.

Another popular EE intervention demonstrating high success is the Issue Investigation and Action Training (IIAT), as suggested by its name, this EE intervention emphasizes critical thinking and action training. The program encourages students to critically evaluate the underlying problems and to act accordingly. This raises students’ sense of self-efficacy thereby increasing environmental attitudes and the frequency of overt pro-environmental behavior. Students who underwent IIAT reported engaging in more pro-environmental behaviors, greater knowledge of action skills and of perceived skill in the use of environmental action skills (Ramsey, 1993).

However, not all EE interventions have proven to be successful. For example, in a review of 34 published studies only 14 were found to have positive effects. This review highlights the importance of a strong methodological approach because the methodology for collecting data has a

considerable impact on the validity of the obtained results. A review of various EE programs suggests that an over-reliance on facts can deter success in EE interventions. According to Hines, Hungerford & Tomera (1987), overemphasizing knowledge alone is the biggest reason why most EE interventions fail. De Young (2003) provided four guidelines for a successful EE. These four guidelines are: 1) gear the program to the audiences' current level of knowledge; 2) explain both sides of the issue; 3) encourage more direct contact with nature and 4) simulate a sense of personal responsibility and control. These recommendations emphasize the importance of targeting the three facets of an environmental attitude: the cognitive component, affective component and conative (behavioral) component. According to this research, the content of an energy dashboard must encourage individuals to find personal relevance within the temporal, spatial and social context of the issue. These findings serve as a guide for recommendations and future improvements.

Rational Choice Theory

Various theories have been developed to explain the relationship between environmental knowledge and environmental behavior. One such theory is rational choice theory. This theory supports the idea that humans make rational choices based on the attitude of “wanting more rather than less of a good” (Kollmuss & Agyeman, 2010). Because people want more, they seek the most cost-effective means to achieve a specific goal. According to this theory, a simple linear relationship exists between knowledge, attitudes and action. (Seaver, 1976) The study “Decreasing Fuel-Oil Consumption through Feedback and Social Commendation,” (Seaver,

1976) supports a rational choice explanation of behavior. To test whether knowledge and commendation affect behavior, the author addressed the impact of feedback and commendation on home fuel-oil conservation. Participating households were randomly assigned three treatment conditions, no-feedback, feedback and feedback plus commendation. The results of the study demonstrated that commendation coupled with informational feedback significantly reduced fuel oil consumption in households.

Rational choice theory assumes that because people want more of a good, they will pursue the most cost-effective approach to achieve a specific goal. While the results of this study support rational choice theory, the strength of this theory is weakened due to the methodology employed. The study was conducted during an acute period of oil-scarcity. During this period, pre-existing social expectations of resource-conservation magnify the impact of commendation. This study suggests that cost-savings is the primary motivation for energy-conservation; however, most individuals take into account multiple factors in a cost-benefit analysis. This theory does not address possible mediators of environmental behavior such as social-norm, pre-conceived notions about energy use or personal perception of control. Further investigation is necessary to determine the underlying mediators that might influence energy-related decisions. This research project rejects rational choice theory because of its one-dimensional explanation of pro-environmental behavior.

Ajzen's Theory of Planned Behavior

Ajzen's Theory of Planned Behavior is relevant to this study because this theory informs the type of information that should be present in an energy

dashboard. Ajzen's Theory of Planned Behavior emphasizes that facts alone do not necessarily influence environmental attitudes. According to Theory of Planned Behavior, the following three factors shape an individual's intention to act environmentally: a belief that it is the social norm to act environmentally; a positive attitude towards the behavior; individuals' perceived behavioral control over their ability to make an impact. According to Gifford (2007), the more likely these factors point in the right direction the more likely for an individual to act in a pro-environmental manner. (Gifford, 2007) The Theory of Planned Behavior posits that these three variables strongly predict intention to act.

Han, Hsu & Sheu (2010) investigated relationship between mass communication and waste recycling behaviors in Hong Kong. Ajzen's theory of planned behavior was used to assess the factors that influence behavioral intention and actual use of recycling canisters among 173 randomly selected household members. Han, Hsu & Sheu (2010) found that 'attitude, subjective norm and perceived control explain forty-four percent of the variance in behavioral intention'. The study also found behavioral intention predicts recycling behavior. (Han, Hsu & Sheu, 2010)

Chan (1998) sought to understand how attitude, subjective norm, and perceived behavioral control positively affected intention to stay at a green hotel. This study confirmed that attitude, subjective norm, and perceived behavioral control positively affected intention to stay at a green hotel. Chan (1998), however, did not find significant differences between intentions to stay in a green hotel across

groups who practice environmentally friendly activities (EFA) as compared to non-EFA groups.

The aforementioned research identified three independent, statistically significant predictor variables of behavioral intention to act pro-environmentally. While further investigation is needed to clarify the relationship between behavioral intention and action, research indicates that attitudes, subjective norms, and perceived behavioral control positively account for significant differences in behavioral intention. For an energy dashboard to influence an intention to act pro-environmentally, it must support the Theory of Planned Behavior and its three independent determinants of behavioral intention. Therefore, energy dashboards should first foster a positive attitude (content should convey the impact of conservation behaviors). Second, it must encourage perceived control (convey possibilities for personal control). Third, the dashboard intervention must foster a culture of conservation among community members.

Goal Setting Theory

Another relevant approach to understanding the complex relationship between motivation and resulting behavior is the goal-setting theory. Goal setting theory states that establishing specific, measureable, achievable, and timely goals provide direction for an individual's work and increased performance (Terborg, 1978). The results of Birch & Veroff's (1986) study demonstrate that participant behaviors align with their assigned goal conditions: quantity- oriented goal, quality-oriented goal or no assigned goal (Birch & Veroff, 1986). Goal-setting EE interventions, such as dashboards, can help individuals develop a sense of direction

and purpose in order to ensure that behavior aligns with the specific and measurable pro-environmental goal, such as engaging in daily recycling. According to Goal Setting Theory the ability to set specific, achievable goals for energy conservation is crucial in order to accomplish them. Goal setting theory suggest that in order for dashboards to foster pro-environmental behavior they must determine a baseline, establish an attainable goal and provide feedback when goals are accomplished regarding its implications. In this review, Goal Setting Theory was accepted as necessary element and was used to drive decisions regarding an energy dashboard's content.

Incentive Theory

Similar to rational choice theory, incentive theory posits that financial commendation mediates relationships between environmental knowledge and environmental behavior. Incentive theory argues that when a reward is presented after the incidence of a behavior, the behavior will occur again. Incentive theory was used to assess the impact of commendation on the behavior of depositing litter in an appropriate trash container (Kohlenberg, 1973). The investigator observed a single park-trash receptacle in a public zoo which had an "incentive sign". The treatment condition consisted of commending litter deposits with a ticket redeemable for a soft-drink and a commendation phrase (Kohlenberg, 1973). Based on the results, the author concluded that reinforcing placing litter in the receptacle resulted in a significant increase in total number of litter deposits. However, the methodology weakens the study; "repeaters" were observed and could have inflated the results of the study. While strong evidence exists for the effects of behavioral reinforcement on pro-

environmental behavior, the study does not address how such behaviors can be sustained without costly external stimuli.

Incentive theory states that commendations can be effective mediators of pro-environmental behavior (Kohlenberg, 1973). This research indicates that applying incentive theory is difficult without costly external motivators. Unlike the cited research, the main purpose of the energy monitoring devices is to incentivize energy savings. An energy dashboard allows individuals to monitor their building's energy consumption throughout the year. This gives individuals the ability to manage their energy-use and therefore save resources and money. Financial incentives are difficult to administer in public buildings with many people. However, when 'incentives' are placed in a larger context beyond personal financial gain, motivation can come from a desire to make a positive impact or to foster competition between dormitories. Offset cost is one way to communicate the impact of these actions. Incentive theory suggests that when positive behaviors receive commendation, they are more likely to be repeated. The real-time feedback provided by energy dashboards helps contribute to a sense of occupant control. The need for commendation was accepted as necessary element in an energy dashboard's content.

Self-determination Theory

Self-determination theory (SDT) has strong implications for environmental education (EE) that have been previously overlooked by researchers. Self-determination theory suggests that people are more likely to conduct a behavior if it is internally rather than externally mediated (Darner, 2009). Sustained motivation to conduct pro-environmental behaviors is a key objective of most EE interventions because

‘motivation’ is more closely linked to pro-environmental behaviors. In the article, “Self-Determination Theory as a Guide to Fostering Environmental Motivation,” Darner argues that SDT can be used to cultivate sustained motivation and consequently foster engagement in pro-environmental behaviors. It is important to view self-determination theory as a catalyst for the “intention to act” among individuals. (Darner, 2009) The author’s argument regarding SDT is relevant to this research because self-determined motivations are less likely to be controlled by external forces. SDT theory suggests that the frequency of pro-environmental behaviors is highest when it is internally vs. externally regulated (Darner, 2009). In the long-run, self-determined motivations continue to exist regardless of an external incentive.

The theory of self-determination is relevant to this research because people are more likely to find value in carrying out pro-environmental actions if they understand the underlying reasons for why change is necessary. Therefore the recommendations derived from the dashboard’s use are more likely to be carried out if the subjects value learning about energy-use in buildings instead of taking a purely prescriptive approach. Furthermore, because energy dashboards help users appreciate the positive implications of conservation actions, they are more likely to find personal value in saving energy over a sustained period of time. Inspiring self-determination, an internally rather than externally mediated behavior, should be an important component of an energy dashboard.

2.2 Part Two: Electricity consumption feedback (ECF) systems

The second part of this literature review evaluates relevant research on electricity consumption feedback (ECF) systems. Gaps, trends and relevant progress in the existing body of ECF research are identified to better understand how these technologies promote pro-environmental behaviors.

The National Environmental Literacy Project

The study demonstrates that environmental literacy among 6th and 8th graders is moderate to high at the national level. However, the study concluded that students consistently over-report their verbal commitment and undertake few pro-environmental behaviors (McBeth & Volk, 2010). This study is relevant to EE research because this systematic over-reporting of verbal commitment demonstrates a need for effective behavioral mediators that cultivate a necessary skill-set in order to translate knowledge into behavior.

Participatory Design

One alternative to providing citizens with the skill set necessary to translate knowledge into pro-environmental behavior is to engage people in participatory design. Participatory design encourages users to think creatively about how to change their current energy intensive living solutions (Strengers, 2008). Strengers' research asserts that our energy choices are deeply influenced by the need to carry out daily activities. These choices are mediated by cultural and social forces, not merely by rational choice (Strengers, 2008). Participatory design interventions can serve as interactive strategies to target embedded social norms which are the largest contributors to household energy and water consumption (Strengers, 2008). Energy dashboards represent a potential tool for actively problem solving personal energy

saving solutions. One benchmark against which an energy dashboard's effectiveness should be evaluated is whether or not it has features that encourage individuals to actively think about and resolve their own energy needs. The utility of a prescriptive solution is limited to a specific building's context. Encouraging active problem-solving for personal energy saving solutions broadens the utility of the dashboard and is likely to extend beyond the existing context. It is critical for an energy dashboard to adopt participatory design features in lieu of prescriptive solutions.

Units of Measurement Facilitate Comprehension

Elements of an interface design, such as a chosen unit of measurement, are critical in order to effectively communicate building energy-use to occupants. Strengers (2011) conducted a qualitative study of three Australian energy and water eco-feedback programs utilizing eco- feedback in-home-display systems. Strengers (2011) identified that users of eco-feedback-in- home-display (IHD) systems had difficulty in understanding the data provided through their in- home-displays (Strengers, 2011). Strengers explains:

“ Some household users were unable to understand the resource language used: ‘On the eco-Meter it says 2.7 tonnes per day. What is a tonne?... There’s no description’ (EcoPioneer, 6)”. (Strengers, 2011)

Strengers (2011) asserts that elements of an interface design, such as a chosen unit of measurement, are critical to the effective utilization of a dashboard interface. This is a clear example of how a single design element, the chosen unit of

measure, can represent a barrier in effective communication and subsequent energy conservation behaviors.

2.3 Part Three: Protocols for Website Analysis

The third part of this literature review covers three website-analysis methodologies adapted to measure the energy dashboard's effectiveness in communicating information to a specific audience. These methodologies include: the task-analysis & think out loud protocols, post-test questionnaire items and data-analysis of usability issues. The origin and purpose of these methodologies are reviewed in the following paragraphs.

2.3.1 Protocol for Website Analysis

Task-analysis is a protocol for website analysis that evaluates a website's ease of use. Task-analysis requires participants to complete a series of tasks using the website. On-screen behavior is recorded using time-stamped video during the data-retrieval process. This protocol is highly regarded by researchers as method to identify usability issues in websites and other interactive interfaces.

In his study, *Information Scent as a Driver of Web Behavior*, Card introduces a replicable protocol for website analysis (Card, 2001). The author details a methodological approach to record user interactions with a browser, and a cache of the websites encountered. Card applies the method to eight Web protocols in order establish trends among website-browsing behaviors. This dashboard study's methodology differs from Card's (2001) because, unlike Card's, this study does not examine the information structure of the Web. Nevertheless, the instrumentation

suggested by Card to examine browsing behavior is still relevant to this study. Card uses KeyLogger, a software that records mouse-clicks and time for all the websites visited. Adopting aspects of this standardized instrumentation technique will strengthen the proposed study and allow for some cross-comparison of data across multiple studies.

Similar to the method employed by Card (2001) this study documents the amount of time (comprehension times) and the number of mouse clicks required to complete each task. These metrics provide insight into the difficulty of completing each task. Comprehension times & mouse-clicking behavior (correct and incorrect) highlight features that enable or hinder user experience. This method is an effective way of improving user-satisfaction. To date, this type of analysis has not been used to evaluate user-fit of an energy dashboard interface among the college campus community.

2.3.2 Usability Testing & Think Out-Loud Protocol

In the past fifteen years, a substantial body of literature explaining usability-testing methods has emerged (for example, Nielsen 1993, Rubin 1994, Dumas and Redish 1999, Mayhew 1999, Preece et al.2002). Usability testing literature emphasizes two categories: one with representative-user groups and another with usability specialists.

The most popular form of usability testing has representative user-groups work through a series of tasks. Participants' are also encouraged to voice their thoughts 'out-loud' while navigating a website interface. 'The think-out-loud protocol' is meant to capture a participant's subjective evaluation of an interface. This method for identifying usability issues was first described by Dumas and Redish (1999). Similar

to this method, ‘Co-discovery’, otherwise known as ‘paired –user testing’, has two individuals work through the given tasks and collaboratively discuss the interface (cite). Focus groups are another form of usability testing that involves collaborative discussions among 4 to 10 individuals. A Heuristic evaluation (or ‘cognitive walk-through’) is a unique type of usability testing because it employs usability specialists to identify typical problems a user might encounter.

The dashboard study’s methodology adopts two forms of usability testing: focus groups and the method utilized by Dumas and Redish (1999). As described by Rubin (1994), representative user-groups help identify user fit discrepancies between the intended audience and the interface design.

2.3.3 Post-test Interview Items

One limitation imposed by the think-out loud protocol is that participants are charged with three cognitive tasks: answering questions, exploring and also evaluating the website for the first time. While it is very valuable to capture the difficulties encountered when navigating the website, it is also important to evaluate user’s subjective evaluation of the interface post-task analysis. In order to develop an acceptable pool of usability item-scales, the following literature on usability rating systems was reviewed.

The System Usability Scale (SUS) is subjective rating of an interfaces’ effectiveness, efficiency and satisfaction. The ten-item scale is employed in situations where a fast, valid scale with a wide applicability is needed. (Brooke, 1996) Bangor,

Kortum, and Miller (2008) conducted over 2,000 SUS assessments across eight years and found the scale to be highly reliable.

The Questionnaire for User Interaction Satisfaction is widely employed to measure user satisfaction of a computer interface (Chin *et. al.*, 1988). QUIS employs twenty-seven items to measure subjective satisfaction along four facets of an interface: screen factors, terminology and system feedback, learning factors and system capabilities. Chin *et. al.*, (1988) found the scale to have high reliability with a Cronbach alpha of 0.94.

The Computer System Usability Questionnaire has only 15 items and has been widely applied in field testing of interface usability due to its succinct nature. (Tullis & Setson, 2004) The scale was developed with the intent of producing the most simply worded, generalizable, statistically valid and reliable scale possible (Brooke, 1996).

The IsoMetrics Usability Inventory is meant to be an operationalization of seven usability facets outlined by ISO 9241 (Gediga, Hamborg and Düntsch, 1999). Participant exposure to the interface has ranged from a brief 20-minute session up to a period lasting several days. (Gediga, Hamborg and Düntsch, 1999)

The Software Usability Measurement Inventory (SUMI) is comprised of a 50-item questionnaire, making it one of the most extensive scales available. SUMI's main assets is a database with over 200 interface usability profiles. Among the interfaces evaluated by SUMI are word processors, spreadsheets, travel reservation websites, CAD and other graphics software'. (Kirakowski & Cobett, 2006)

Question items from the aforementioned scales were employed to create an initial item pool for post-test interview questions. All scales are statistically valid and reliable five-point, Likert type scale questions.

2.3.4 Data Analysis Methods

Several data analysis methods are available for usability issues. In order to focus attention on the usability issues that really matter, the researcher will use Albert et al.'s (2008) rating system. In order to get an overall sense of how one product compares to the other product, "the number of unique issues, not the total number of issues, encountered by all participants" will be identified and compared between the dashboards (Albert et al. 2008). The compiled results will inform the recommendations.

2.4 Conclusion

To identify a theoretical framework and develop a methodological approach, the researcher conducted a literature review within three major fields. First, environmental attitudes and behavioral research theory were reviewed in order to create a theoretical framework. Second, current gaps in the field of electricity consumption feedback (ECF) research are identified. Third, a methodological approach developed using research from the field of website analysis. In the following chapter, this methodological approach will be explained in greater detail.

3. METHODOLOGY

3.1 Objectives & Hypothesis

3.1.1 Objectives

This between-subjects, comparative-case study analyzed which of two ‘energy dashboard’ web-based software communicated building resource consumption with less difficulty and in a more intuitive manner. The two dashboard treatments compared in this study consisted of the Alerton Energy Dashboard (employed by the Human Ecology Building) and Lucid Dashboard (employed by Cornell University campus buildings). Participants were randomly assigned to ensure equivalence across treatment groups. A between subjects design avoided both carry-over and testing effects therefore strengthening the internal validity of the findings. A total of six outcome measures were collected (four quantitative and two qualitative measures).

01: number of mouse clicks (effort) necessary to complete each task

02: amount of time (comprehension time) necessary to complete each task.

03: number of successfully vs. unsuccessfully completed tasks.

04: number of unanswered tasks

05: unique usability issues were identified

06: ability to build upon user’s “sustainable knowledge” was qualitatively measured

Four quantitative outcome-measures were extracted from the task-analysis using a time-stamped video and audio recording. The degree of difficulty in accessing and interpreting information from each energy dashboard was evaluated based on the

number of mouse-clicking behaviors (effort) and amount of time (comprehension time) required to complete each task. The third measure determined efficacy using the number of successfully vs. unsuccessfully completed tasks. The fourth quantitative measure identified the number of ‘skipped’ or unanswered tasks. Methods for statistical analysis of these four quantitative outcome-measures are discussed later in the chapter.

Two types of qualitative data were gathered. As a fifth outcome-measure, usability issues were extracted from the think-out-loud protocol. In this dashboard study, the think-out-loud protocol consists of voice recordings from the task-analysis and post-test interview. Usability issues are characteristics of the dashboard that either hinder or enable the user experience. The sixth outcome-measure gaged differences between dashboards’ ability to build upon users’ ‘sustainable knowledge’. Implications of the qualitative analysis are discussed under the ‘recommendations’ chapter.

3.1.2 Hypothesis

The following five hypotheses were arrived upon based on the researchers’ own navigation experience while completing the task-analysis (after item-development but prior to the pilot test experimental stage). Focus groups and interviews were conducted prior to the experiment in order to generate categories for important usability issues. Subsequently, nine task-items and a twenty item post-test interview were developed. A pilot test evaluated the nine task-items and post-test interview questions.

H01: On average, the Alerton Energy Dashboard will take a significantly greater number of mouse clicks (effort) per task (across all tasks) than the Lucid Dashboard.

H02: On average, the Alerton Energy Dashboard will take significantly greater amount of time (comprehension time) per task (across all tasks) than the Lucid Dashboard.

H03: On average, the Lucid Dashboard will have a significantly greater number of successfully vs. unsuccessfully completed tasks than the Alerton Energy Dashboard.

H04: On average, the Lucid Dashboard will have fewer ‘skipped’ or unanswered tasks than the Alerton Energy Dashboard.

H05: On average, neither the Alerton Energy Dashboard nor the Lucid Dashboard will differ significantly in the way they build upon the users’ “sustainable knowledge”.

* (Alerton Energy Dashboard is employed by Human Ecology)

** (Lucid Dashboard is employed by Cornell University)

3.1.3 Treatment

This section explains the differences present between the two dashboard treatments. Although the dashboards’ objectives are analogous, the specific tactics that they use to convey energy savings vary significantly. The aesthetics, & graphics, main navigational tools & content are considerably different across dashboard treatment. Lucid Dashboard represents a commercially available dashboard option. More than seventy universities throughout the United States adopted this dashboard product. This makes Lucid the single most popular dashboard on the market. Lucid Dashboard has the ability to compare electrical/heating & cooling energy demand across multiple buildings and within each building. In contrast, the Alerton Energy Dashboard is uniquely designed to communicate the Human Ecology Building’s electrical, heating

& cooling energy demand trends. This dashboard also conveys energy conservation building features unique to the Human Ecology Building.

3.2 Setting

The spatial conditions of the experiment were recorded prior to the start of each trial. The design qualities of this space were also noted. The experiment takes place in a neutrally colored room with as few auditory distractions from the exterior environment as possible. Controlling for the spatial and auditory conditions eliminated possible confounding variables and strengthened the internal validity of the experiment. Further research should examine how context (i.e. visibility of treatment/ location) influences the outcome measures. Participants were asked to sit in a standard desk chair directly in front of the Mackintosh notebook monitor on which the experiment was conducted. All equipment used (camera and computer) was set up prior to the experiment by (the experimenter) to ensure only participants' on-screen interactions and voice were recorded. After each experiment, the web-browser was shut down and re-started. Participants remained anonymous. Personal identifiers (email and net ID) were collected solely for coordinating the project and compensation purposes.

3.3 Participants & Recruitment

All participants were full time graduate or undergraduate students currently enrolled at Cornell University. The experiment was run on a Macintosh computer. Therefore, all participants were required to be proficient at using a Mackintosh laptop.

The ten focus group participants and two interview participants were recruited via Cornell's SUSAN website. Participants recruited via SUSAN were offered class credit to compensate for their time. Alternately, financial compensation was also offered.

For the pilot study, seven Cornell University undergraduate participants were recruited mainly through fliers posted throughout the College of Human Ecology. Participants were offered a financial incentive. All participants received compensation as long as they completed the study entirely. Participants were also required to complete the post-test interview.

For the final study, sixteen Cornell University undergraduate participants were recruited more widely in order to obtain more diverse body of participants. The researcher recruited via multiple undergraduate and graduate-student list-serves across three colleges (including the College of Human Ecology), via the West-campus (second year and upperclassmen housing) list-serves and through flyers posted throughout campus. Final study participants were offered the same incentive as pilot study participants. Although participants were self-selected volunteers, the study has strong external validity because participants were recruited across all class-rankings and from a wide range of academic disciplines (refer to Table 16 in the Appendix). External validity is critical because recommendations developed are meant to inform energy dashboards beyond Cornell University.

3.4 Instrumentation

In this study, Camtasia, a video recording software used for key-stroke identification, was used to record mouse-clicks and on-screen behaviors. Additionally, the software

recorded on-screen activity and kept a time-log of when these activities occurred. Camtasia runs silently without interfering with a user's navigation-experience (Camtasia, 2012). The experiment trial was run on a Macintosh MacBook Pro (6.2).

Using Camtasia software strengthened the study's internal validity by minimizing observer effects. This instrumentation was borrowed from the study "Information Scent as a Driver of Web Behavior". Here, Card (2001) presented a methodological approach for website analysis of browsing behaviors. To analyze this behavior with minimal interference, Card recorded participants' onscreen interactions using KeyLogger software. For this thesis, a more contemporary software, Camtasia, was used in order to seamlessly record participants' website experience.

3.5 Procedures

At the beginning of each focus group, interview and experiment session participants were given a letter of consent articulating the purpose of the project, explaining its confidential nature and thanking volunteers for their time. The letter of consent also provided the researcher's contact information and encouraged additional feedback. Instructions were provided in the letter of consent. For the pilot test and final study, participants were presented with a three-minute instructional video before starting the experiment. The instructional video explained the think out-loud protocol. Ericsson and Simon (1984) provided a sample script of instructions and a warm up-exercise to prepare participants for the think out loud procedure. These recommendations served as a template for the instructional video prepared by the researcher. After the video showing, any remaining questions were re-explained/clarified verbally at participants' request.

3.5.1 Focus Group (Post-test Interview Items and Task Development)

A focus group was conducted to develop task-items and the post-test interview questions - specific to the two energy dashboard interfaces. Additionally, the focus group was designed to gain a preliminary understanding for usability issues presented across dashboard treatment. First, focus group participants were confidentially emailed a link to the two dashboard websites ahead of time. Participants were requested to become familiar with both of the energy dashboards. Additionally, they were asked to answer the following four questions ahead of time:

a. Can you rank the top ten tasks in order of importance for which you would use an energy dashboard (from most important to least important)?

b. Please identify tasks that are neutral in terms of difficulty (represented in time and steps to complete the task) for the Cornell dashboard & Yale dashboard respectively.

c. Please identify features of the energy dashboard that are most important for you (to accomplish the aforementioned tasks) for the Cornell dashboard & Yale dashboard respectively.

d. Please identify features of the energy dashboard that are least important for you (to accomplish the aforementioned tasks) for the Cornell dashboard & Yale dashboard.

Second, participants were asked to brainstorm additional categories for “key facets” of an energy dashboard interface. A “key facet” refers to important aspects of the users’ navigation experience. Focus group participants were also asked to expand the item pool for the post-test interview. The purpose of the post-test interview was made clear to participants. The post-test interview meant to evaluate the dashboards’ written content, graphic layout, navigation experience and overall impact on sustainable behavior. Focus group participants also borrowed some concepts from the original sources and helped with the rephrasing of these concepts – tailoring them to the energy dashboard interfaces at hand. Random probes were conducted to confirm the subject’s interpretation of the original meaning of the statements and to help refine the wording. The following sources were referenced to create the initial question item pool: a) System Usability Scale (SUS); b) Website Analysis and Measurement Inventory (WAAMI); c) The Questionnaire for User Interaction Satisfaction (QUIS); d) Computer System Usability Questionnaire (CSUQ); e) IsoMetrics Usability Inventory; f) Software Usability Measurement Inventory (SUMI). Statistically valid and reliable scales were selected to ensure accurate and consistent measurements of users’ experience, while ensuring the construct, dashboard usability, was accurately recorded. Usability, is defined by ISO 9241-11 Standard as the “extent to which a product can be used by specified users to achieve specified goals with effectiveness and satisfaction in a specified context of use”. (Stewart, 2009)

Participants were made aware of the expected time frame for the experiment (40 minutes). Time & task breakdown were provided as follows:

[Prior to arriving to the study] Become familiar with the energy dashboard.

[5 minutes] Read, understand and sign the consent agreement.

[15 minutes] Develop task-items for the usability study by answering the four aforementioned questions.

[20 minutes] Expand the item pool for the post-test interview.

Generate design categories that encourage successful student interaction.

Generate questions based on design categories: written content, graphic layout, navigation experience & impact on sustainable behavior.

Rephrase original concepts for the energy dashboard at hand

3.5.2 Interview (Item Elimination Procedure)

Two individuals were asked to review the post-test question items. The intended purpose of this interview is to eliminate unnecessary question items. The website address was sent out to the participants ahead of time via confidential email to ensure they become familiar with both dashboards.

A form with the initial question item pool was presented to each of the two judges. The judge and researcher reviewed the items together in a group context. Random probes were presented verbally to make sure the judges fully understood the meaning of the statements. For example, judges were asked to verbalize their interpretation of task-item #5. Judges were also asked to indicate whether an item was positive or negative. Questions were revised based on this feedback. After this elimination procedure, a questionnaire was generated; the statements were reordered based on the initial categories agreed upon by the focus group discussion. This interview procedure ensured that the question items more accurately reflected the

measured construct, usability, as it pertains to this dashboard study. Therefore, this interview procedure strengthens internal validity.

Participants were made aware of the total length of the interview, 35 minutes. Time & task breakdown were provided as follows:

[Prior to arriving to the study] Become familiar with the energy dashboard.

[5 minutes] Read, understand and sign the consent agreement.

[15 minutes] Review the task-items for appropriateness, eliminate unnecessary items and rephrase concepts for clarity. Undergo random probes to confirm the original meaning of the tasks is correctly interpreted.

[15 minutes] Review post-test interview questions for appropriateness, eliminate unnecessary items and rephrase concepts for clarity. Undergo random probes again to confirm the original meaning of the tasks is correctly interpreted.

3.5.3 Pilot Study (Testing Survey Questions Instrument and Procedures) & Final Study

As mentioned previously, seven Cornell University undergraduate and graduate student volunteers were recruited for the pilot study and sixteen were recruited for the final study. The purpose of the pilot study was to test the interview survey instruments and procedures. The final study comparatively measured of the effectiveness of a dashboard in conveying energy consumption to the undergraduate student population.

In order to identify design features that either enabled or hindered the navigation experience, the researcher simulated and tracked a user's experience as they navigated the dashboard-interface. This approach is formally called a task-

analysis. *The task analysis procedure allows users to navigate specific areas of the energy dashboard and provide user-experience related feedback.*

To complete the task-analysis and successfully answer these task-items, participants were required to navigate the dashboard-interface. Users received the nine task-items in the form of a virtual game. This was done to make the study more engaging for all users. Participants were offered a financial incentive for successfully completing 80% of the nine tasks in approximately a 20-minute period. However, no strict time limit was imposed. As a result, all participants were equally motivated to participate regardless of their affinity for issues of “environmental concern”. After completing each question, participants were required to verbalize when they moved onto the next question/task.

While completing a set of questions, the participants were required to verbalize their thoughts on three aspects of the dashboard interface: written content, graphic layout and navigation experience. This procedure, called a think-out-loud protocol, helps researchers obtain a detailed description of both manual and mental activities, task and element durations, task complexity and any other unique factors involved in or required for people to perform a given task. In both the pilot test and final study, participants listened to the three-minute instructional video before starting the experiment. The experiment was video-recorded so that the verbal responses could be transcribed for data-analysis.

The task analysis and think out loud procedures emulate Dumas and Redish (1999). A large body of literature employs these procedures, which continue to have a strong presence in the field of psychology and usability testing (Card, 2001, Nielsen

1993, Rubin 1994). Some experts argue that the talk-out-loud protocol represents a high cognitive load, resulting in longer answering periods. However, the procedure was present across both studies and carried out by all participants. This diminished the possible threat to internal validity.

This study employed a user-centered task-analysis procedure. Stewart (2009) described three main forms of usability testing. These approaches are: the user-centered approach, heuristic approach, and group thinking. This study took a user-centered approach, which requires a representative user to navigate the dashboard and provide feedback. This usability test was chosen because it most closely approximates issues arising from a user's true experience. In an alternate heuristic usability test, experts conducted a 'cognitive walk-through evaluation'. In this evaluation, experts envisioned the kinds of problems they face while using an interface. According to Rosenbaum (2000), heuristic evaluations continue to be the most commonly employed. However, heuristic evaluations uncovered fewer critical issues and a greater number of minor issues compared to user-centered usability tests. (Desurvire *et. al*, 1992, Bailey *et. al*, 1991, and Jeffries *et. al*, 1992). Group thinking involves four to ten representative users who openly discuss usability issues they might encounter when utilizing the product interface (Molich & Dumas, 2008). Group thinking often includes a 'facilitator'. The facilitator provides a prompt or may probe the group members with previously prepared questions. (Molich & Dumas, 2008)

The following six outcome measures were collected (four quantitative and two qualitative measures):

01: number of mouse clicks (effort) necessary to complete each task

02: amount of time (comprehension time) necessary to complete each task.

03: number of successfully vs. unsuccessfully completed tasks.

04: number of unanswered tasks

05: unique usability issues were identified

06: ability to build upon user's "sustainable knowledge" was qualitatively measured

Participants were made aware of the expected length of time for the experiment (35 minutes). Time & task breakdown was provided as follows:

[5 minutes] Read, understand and sign the consent agreement.

[5 minutes] Listen to an instructional video on how to conduct the "think-out-loud protocol" prepared by the experimenter.

[20 minutes] Conduct the task analysis. Complete the 9 tasks while participant's voice and onscreen interactions are recorded.

[5 minutes] Complete a twenty item post-test interview.

3.6 Data Analysis

3.6.1 Statistical Tests

Two types of statistical analysis were employed to statistically analyze the quantitative outcome-measures: the Mann-Whitney U test and Fisher Exact test.

3.6.2 Mann-Whitney U test

The Mann-Whitney U test determined significant differences exist across dashboard treatment in outcome variables 01 & 02. This test evaluated if a significantly greater number of mouse clicks (effort) and/or time (comprehension time) is required per task (across all tasks).

The Mann-Whitney U test is appropriate for outcome measures 01 & 02 because it compares differences between two independent, categorical groups. In this study, the participants were exposed to one of the two dashboard treatments. Furthermore, the dependent variables (i.e. mouse-clicks, time) are measured at interval/ratio level. Independence of observations must also exist. As observed by this dashboard study, no relationship exists between the observations in each group or between the groups themselves. Unlike a t-test, a Mann-Whitney U test is less likely to spuriously indicate significance of type I or type II errors due to outliers. The Mann-Whitney U test is based upon ranking the observations of the combined sample. Subsequently, the Mann-Whitney U test was chosen over a t-test because it is more robust. (Laerd, 2013)

3.6.3 Fisher Exact Test for 2 x 2 Table

Fisher's Exact test was used to determine significant differences across dashboard treatment in outcome variables 03 & 04. First, the Fisher Exact test evaluated significant differences in the number of successfully vs. unsuccessfully completed tasks across treatment. The Fisher Exact test was also used to evaluate if there are significantly fewer "skipped" or unanswered tasks across treatment.

The Fisher Exact test is appropriate for outcome measures 03 & 04 of this study because it examines two independent groups that fall within two mutually exclusive classifications. Unlike a chi-squared test, Fisher's exact is appropriate for small sample sizes. (Laerd, 2013) Fisher's Exact, 'calculates the exact statistical deviation from a null hypothesis, instead of depending on an approximation that becomes exact in the limit as the sample size grows to infinity'. (Laerd, 2013)

3.6.4 Outcome Measure - Comprehension Time

The longer the ‘comprehension time’ to answer a question, the more difficult the question was to find. To determine amount of time required for answering each of the task-items, the following criterion for start/stop time was adopted. Start time begins when the participant has fully read the question out-loud. Some participants did not fully read the question out-loud. In these instances, time initiated when the participant actively began searching for a solution. Time ended when the participant voiced (s)he finished answering the question. If a stopping-point was not stated explicitly, time ended when a participant stopped making comments specific to the question at hand and/or moved on to the next question. Participants were allowed to pause during the experiment to ask questions/clarification and this time is subtracted. To evaluate the comprehension time, the experimenter went through each of sixteen interviews and determined start /stop times for each task-item. On average, it is hypothesized that the Alerton Energy Dashboard will take a significantly greater amount of time (comprehension time) per task (across all tasks) than the Lucid Dashboard.

3.6.5 Outcome Measure - Mouse clicking behavior

The total number of mouse clicking behaviors for answering each task-item was evaluated. To analyze the data, the researcher examined statistical differences between the two dashboards. On average, it is hypothesized that the Lucid Dashboard will have a significantly greater number of successfully vs. unsuccessfully completed tasks than the Alerton Energy Dashboard.

3.6.6 Outcome Measure - Successfully vs. Unsuccessfully completed task-items

Task-item questions were evaluated to identify whether they were answered successfully vs. unsuccessfully. Task-item questions are time sensitive. Therefore, a criterion was developed to determine whether each of the questions was correct/incorrect based on whether or not the necessary “steps” to complete each question were met. This criterion is outlined with greater detail in the Appendix. On average, it is hypothesized that the Lucid Dashboard will have a significantly greater number of successfully vs. unsuccessfully completed tasks than the Alerton Energy Dashboard.

3.6.7 Outcome Measure - Number of unanswered task-items

The total number of unanswered questions was compared across dashboard treatment (Lucid vs. Alerton). On average, it is hypothesized that the Lucid Dashboard will have fewer “skipped” or unanswered tasks than the Alerton Energy Dashboard. On average, it was hypothesized that the Lucid Dashboard would have fewer “skipped” or unanswered tasks than the Alerton Energy Dashboard.

3.6.8 Outcome Measure - Usability issues

Usability issues were broken down into the following four categories: 1. Aesthetics and Graphics, 2. Navigation, 3. Content, and 4. ‘Usefulness’. In order to get an overall sense of how the two dashboards did in comparison to each other, the researcher measured the frequency of unique usability issues encountered per energy dashboard. This means that the researcher identified “the number of unique issues, not the total number of issues, encountered by all participants” and compared the results across the two dashboards (Albert et al. 2008).

3.6.9 Outcome Measure - Ability to build upon ‘sustainable knowledge’

The qualitative responses to the post-test interview were analyzed in order to determine the usefulness of the energy dashboard. Specifically, the following three questions were used to determine ‘ability to build upon the users’ “sustainable knowledge”. On average, it was hypothesized that neither the Alerton Energy Dashboard nor the Lucid Dashboard would differ significantly in the way they build upon the users’ “sustainable knowledge”.

1. Each user was asked twice: ‘how might the dashboard improve your ability to save energy?’ (see questions below). If the respondent recalled an energy conservation method/tip from the dashboard twice, the dashboard builds upon their environmental knowledge and a point is granted.

(Task Analysis Q9). In the space below, identify one way this website would help you conserve energy.

(Post Test Interview) Identify one energy conservation tip provided by this website.

2. Each user was asked if they found the dashboard ‘useful’ (see question below). The ambiguity of the question was intended to extract an honest response, as compared to a more direct question about knowledge acquired. If the respondent mentioned that the dashboard improved their level of knowledge of energy use in public buildings/ their ability to conserve energy, the dashboard builds upon environmental knowledge and a point is granted. Alternately, if the individual responded that it was useful for the purpose of finding “answers” the dashboard was not successful and does not receive a point.

(Post Test Interview) I found this website useful. (1=strongly agree; 5=strongly disagree)

3. Each user was asked ‘how frequently they would use the dashboard’. If they answered ‘several times a semester’ or more often, without imposing necessary changes to the existing dashboard, the dashboard is likely to influence an individual’s environmental knowledge.

(Post Test Interview) I would use this website on a routine basis. (1=strongly agree; 5=strongly disagree)

4. RESULTS

4.1 Purpose of Task-Items

This section provides a brief explanation of each of the task-item's proposed intent. Feedback from two focus groups and two interviews refined the nine-task items. Each task was designed to expose participants to a specific section of the dashboard and its respective features. The task-items provided insight into how a dashboard was performing. Task-items Q1-Q5, Q8 and Q9 were the same across treatment. Task-items Q6 and Q7 were unique to each treatment. The researcher verified all tasks (Q1-Q9) were equivalent in degree of effort and number mouse-clicks across treatment.

Task-Item	Alerton Energy Dashboard. Question objective:	Objective: Lucid Dashboard. Question objective:
Q1	Investigated ability to locate and interpret total electricity consumption over the past 24 hours (in Human Ecology).	(Same objective across treatment)
Q2	Investigated the ability to locate highest period of electricity consumption within the past 24 hours (in Human Ecology).	(Same objective across treatment)
Q3	Investigated the ability to locate maximum period for cooling and utilize “unit of equivalence” tool (in Human Ecology).	(Same objective across treatment)
Q4	Investigated the ability to locate highest period for cooling over one year (in Human Ecology).	(Same objective across treatment)
Q5	Investigated ability to locate & interpret highest period of ‘steamed water consumption’ within the last month (in Human Ecology).	(Same objective across treatment)
Q6	Investigated how easily participants compared energy use across multiple residential buildings within a custom	Identified student’s ability to locate sustainable design features specific to the Human Ecology Building.

	time-period. Also examined efficacy of the per-person equivalence button.	
Q7	Investigated ability to locate, read and interpret the sustainability tab (describes sustainability initiatives employed throughout Cornell's campus such as Lake Source Cooling Plant).	Investigated whether students located end-source energy consumption (specifically, the lowest point of second-floor plug-load energy consumption within the past 24 hours).
Q8	Investigated whether students understood the overall website mission. Specifically scrutinizes the homepage mission-statement.	(Same objective across treatment)
Q9	Investigated if the website built upon students' knowledge of sustainable building use practices.	(Same objective across treatment)

Table 1 – Task Item Objectives Q1-Q9

4.2 Results Quantitative Outcome-Measures

The following section objectively reviewed the statistical findings of four quantitative measures (mouse-clicks, time, successfully vs. unsuccessfully completed tasks, number of skipped or unanswered tasks). Differences in statistical significance across each task-item were noted. The significance of these findings will be explained under the 'discussion' chapter.

4.2.1 Results - Hypothesis 01

According to the Mann-Whitney Test, participants demonstrated statistically significant differences in number of mouse clicks (effort) to complete tasks Q1, Q4, Q5 and Q9. It was hypothesized that, on average, the Alerton Energy Dashboard would take a significantly greater number of mouse clicks (effort) per task (across all tasks) than the Lucid Dashboard. Hypothesis 01 (H01) was correct. However, H01 was correct for only one of the four statistically significant questions, Q5. Alternately,

the Lucid Dashboard required a greater number of mouse clicks (effort) across statistically significant tasks Q1, Q4, Q5 and Q9. The mean rank indicates that the Lucid Dashboard required a greater number of mouse clicks (effort) across both statistically significant and non-statistically significant task-items.

Statistical Significance	Lucid	Alerton
Q1 is statistically significant: $p = 0.003$, $p < .05$ (onetail)	$M = 33.30$, $SD = 21.52$	$M = 5.68$ $SD = 4.85$
Q4 is statistically significant: $p = 0.021$, $p < .05$ (onetail)	$M = 19.88$ $SD = 31.38$	$M = 1.75$ $SD = 1.39$
Q5 is statistically significant: $p = 0.028$, $p < .05$ (onetail)	$M = 11.50$ $SD = 21.31$	$M = 9.50$ $SD = 3.74$
Q9 is statistically significant: $p = 0.028$, $p < .05$ (onetail)	$M = 10.25$ $SD = 5.68$	$M = 3.38$ $SD = 5.07$

Table 2 - Statistical Significance Across Treatment: Outcome Measure 01

4.2.2 Results - Hypothesis 02

According to Mann-Whitney Test, differences in amount of time were statistically significant for Q2 & Q7. It was hypothesized that, on average, the Alerton Energy Dashboard would take significantly greater amount of time (comprehension time) per task (across all tasks) than the Lucid Dashboard. Hypothesis 02 was rejected for both statistically significant questions, Q2 & Q7. In both instances, the Lucid Dashboard required a greater amount of time (comprehension time). Overall, the mean rank for time was higher for Lucid across all questions except for Q5, Q6, Q8, and Q9.

Statistical Significance	Lucid	Alerton
Q2 is statistically significant: $p = 0.000$, $p < .05$ (onetail)	$M = 1.81$ $SD = .60$	$M = .91$ $SD = .52$
Q7 is statistically significant: $p = 0.015$, $p < .05$ (onetail)	$M = 5.43$ $SD = 3.23$	$M = 1.84$ $SD = .73$

Table 3 - Statistical Significance Across Treatment: Outcome Measure 02

4.2.3 Results - Hypothesis 03

According to Fisher's Exact test, differences in success or failure were not statistically significant for Q1- Q7. This indicates that the distribution of 'success vs. failure' for each task was the same across categories of treatment. It was hypothesized that, on average, the Lucid Dashboard would have a significantly greater number of successfully vs. unsuccessfully completed tasks than the Alerton Energy Dashboard. Due to lack of statistical significance, hypothesis 03 was rejected.

Statistical Significance
Q1 is NOT statistically significant: $p = 1.000$, $p > .05$ (twotails)
Q2 is NOT statistically significant: $p = 0.608$, $p > .05$ (twotails)
Q3 is NOT statistically significant: $p = 0.315$, $p > .05$ (twotails)
Q4 is NOT statistically significant: $p = 0.467$, $p > .05$ (twotails)
Q5 No statistics are computed because Question5Correct is a constant.
Q6 is NOT statistically significant: $p = 1.000$, $p > .05$ (twotails)
Q7 is NOT statistically significant: $p = 0.315$, $p > .05$ (twotails)
Q8 No statistics are computed because Question5Correct is a qualitative answer.
Q9 No statistics are computed because Question5Correct is a qualitative answer.

Table 4 - Statistical Significance Across Treatment: Outcome Measure 03

4.2.4 Results - Hypothesis 04

It was hypothesized that, on average, the Lucid Dashboard would have fewer 'skipped' or unanswered tasks than the Alerton Energy Dashboard. According to Fisher's Exact test, however, differences across treatment for the 'skipped' or unanswered tasks were not statistically significant for Q1- Q9.

4.3 Results Qualitative Outcome-Measures

4.3.1 Usability Issues

The think-out-loud protocol allowed participants to convey inner thoughts about dashboard features that either hinder or facilitate solving a task. In the two sections below (see Tables 06 & 07) the Lucid & Alerton Energy Dashboard's respective usability issues are listed. The usability issues explain why statistically significant differences were present.

Across the Lucid treatment, seventy-five usability issues (thirty three positive themes, and forty-three negative themes) were identified. Specifically, the 'navigation' (n=22) and 'content' (n=23) categories hold the largest number of usability issues across for this dashboard treatment. Across the Alerton treatment, sixty-one usability issues (fifteen positive themes, and forty-six negative themes) were identified across transcribed interviews. The 'content' category (n=32) held the greatest number of usability issues for the Alerton treatment. Descriptive statistics (refer to Table 5 below) provide a category breakdown of all issues across dashboard treatment. The significance of these statistically significant findings, are explained under the 'discussion' chapter. This chapter points out specific usability issues that either hindered or enabled task completion.

	Lucid Dashboard	Alerton Dashboard
Aesthetics & Graphics		
Positive usability themes	10	05
Negative usability themes	8	13
<i>Total</i>	<i>18</i>	<i>18</i>
Navigation		
Positive usability themes	8	01
Negative usability themes	14	04
<i>Total</i>	<i>22</i>	<i>05</i>
Content		
Positive usability themes	11	08
Negative usability themes	12	24
<i>Total</i>	<i>23</i>	<i>32</i>
Usefulness		
Positive usability themes	4	01
Negative usability themes	8	05
<i>Total</i>	<i>12</i>	<i>06</i>

Table 5 - Statistical Significance Across Treatment: Outcome Measure 03

4.3.2 Usability Issues – Lucid Dashboard

The following table enumerates the Lucid Dashboard usability issues that were identified by participants throughout the task-analysis and post-test questionnaire.

# of participants who reported usability issue	Usability Issues - Lucid Dashboard
Aesthetics & Graphics	Usability Issues
1.0	aesthetics & graphics , +, layout : visually cohesive
3.0	aesthetics & graphics , +, layout : content is centered in the middle of the webpage
4.0	aesthetics & graphics , +, appropriate use of color; modern colors

4.0	aesthetics & graphics , +, color hierarchy is used for emphasis; hierarchy makes it easy to find important information (i.e. red tabs & orange label for “commit to conserve”)
5.0	aesthetics & graphics , +, icons & graphics; easy to interpret, approachable, attractive & have appropriate use of color
3+/2-	aesthetics & graphics , +/-, moving images catch attention OR finds movement distracting
2+/1-	aesthetics & graphics , +/-, color & semantics – green and red are appealing (represent sustainability and Cornell) OR dislikes red and green
1.0	aesthetics & graphics , +, Cornell Branding & logo
3.0	aesthetics & graphics , +, color & semantics; color coding works well (i.e. red, blue and orange for heating, cooling, electricity)
2.0	aesthetics & graphics , +, photos are exciting
2.0	aesthetics & graphics , -, text legibility is low (i.e. yellow color for electricity decreases legibility of the text)
2.0	aesthetics & graphics , -, font is not consistent throughout the website
1.0	aesthetics & graphics , -, layout : tabs should be placed higher
3.0	aesthetics & graphics , -, layout : the background wallpaper is “cut-off” by a black box on the bottom half
2.0	aesthetics & graphics , -, label at the top is repeated twice; there are two headings
4.0	aesthetics & graphics , -, scrolling & clicking overall should be eliminated. (i.e.. in the book)
5.0	aesthetics & graphics , -, too much information makes it difficult to focus on a single facet (too many menus, icons & labels - too much clutter)
Navigation	
4.0	navigation , +, heading, tab structure & icons are helpful for navigation; you know what to expect when you open a section
7.0	navigation , +, cognitive map - consistency of the pages
6.0	navigation , +, cognitive map, comparisons, cooling, heating, electricity tabs are clearly defined & easy to manipulate
	navigation , +, cognitive map – title headings were appropriately descriptive (i.e. not misleading)
1.0	navigation , +, cognitive map – (easily found lake source cooling under climate action plan)
5.0	navigation , +, cognitive map- easy to find heating, cooling, electricity at the top under human ecology

6.0	navigation , +, scroll over feature is helpful for looking at content; scroll over effects capture attention; feature on the right is helpful
1.0	navigation , +, cognitive map/ regions - found Human Ecology Building right away
4.0	navigation , -, no cognitive map; user does not systematically search through the site with underlying order; site requires too much scrolling & clicking
4.0	navigation , -, user has a hard time finding CO ₂ , \$ conversation function (is focused on the "comparison tab")
4.0	navigation , -, user is focused on "comparison tab" instead of the top section for heating, cooling, & electricity / CU
7.0	navigation , -, sustainability tab - lake source cooling leaves the dashboard and clicks on external links; sustainability tab appeared to be just pictures
3.0	navigation , -, homepage needs hierarchy; does not know how to get back to the homepage; homepage page is always present at the bottom so it is unclear when you have navigated onto it
1.0	navigation , -, the tabs/ individual buildings at the top do not appear to be clickable items that aid in finding the correct answer
2.0	navigation , -, not everything was in the same place; there was unexpected variation under each tab
7.0	navigation , -, search function is missing
3.0	navigation , -, more "districts" /main tabs are needed in order to minimize the amount of content (length) of each page
4+ / 3-	navigation , +/-, cognitive map/ regions & landmarks- icons make it easy to recall where you are on the webpage
3.0	navigation , -, cognitive map- easy to find cooling, heating, electricity
3.0	navigation , -, did not notice the icons at the bottom right away; recommends making buttons the main focus; recommends making navigation icons at the bottom more prominent so they are the primary focus
2.0	navigation , -, can't zoom out of graphs; , having to scroll left and right, up and down
Content	
4.0	content , +, under "comparisons tab" ability to organize information by alphabetical order/ highest energy consumption is helpful
6.0	content , +, CO ₂ , dollars and per-person equivalent make energy units more tangible/ gave better idea of the personal application; per-person breakdown put personal energy use into perspective
5.0	content , +, "sustainability tab" provides insight into Cornell's sustainable initiatives (i.e. "it was nice to see pictures and stories of what was actually happening")

5.0	content , +, enjoys graphs under the comparisons section
5.0	+, +/-, “customize period” function under “comparisons tab” is useful & easy to use
6.0	content , +, easy to identify features to click on to change content such as: day, month, year & scope very easy to figure out
6.0	content , +, text & graphics – text is not too long ; good balance between graphical & textual information
6.0	content , +, mission on homepage is helpful; conveys message
1.0	content , +, “previous day” comparison button
2.0	content , +, rate per hour use of dollars
1.0	content , +, social networking is helpful
3.0	content , -, introduction into website & types of energy - more information about what I am doing on each of the pages would be helpful (i.e. context as to why I want to know about these types of energy savings upon entering the website)
4.0	content , -, adding more information about what cooling, heating & electricity mean would be important to provide context at the beginning
4.0	content , -, commit to conserve is just a small part of the website but it should be the main part of the website; did not notice commit to conserve
6.0	content , -, units low audience appropriateness; were hard to relate to; require further explaining; (“it feels like I shouldn’t be here”); large accurate figures, loose meaning
4.0	content , -, difficult to derive meaning; what are the determining variables that lead to greater energy efficiency in a building; “each building has different purposes ...”; would like to compare building energy efficiency characteristics – i.e. insulation levels; building type;
7.0	content , -, content/navigation/usefulness; the user was uncertain of how the two sections related to each other (TOP= individual buildings; BOTTOM= comparisons);
4.0	content , -, need to reset “customization” is annoying for comparisons*; would like it if you could save, export the graph or save “customized settings”, make the graph larger etc.; user has a hard time remembering what the units are (for comparison purposes).
3.0	content , -, confused by presentation of the graphs at the top- due to the cumulative percent on the side; uncertain about units – rate of electricity flow
4.0	content , -, user would like to compare all of Cornell’s energy in comparison to other universities or against “greener” buildings; the user feels more benchmarks should be necessary to understand how much energy a standard efficient building uses.

4.0	content , -, x & y axis are not labeled for graphs
2.0	content , -, units should be on the left NOT right it shows me a (cumulative meter with units, \$, CO2, kW)
1.0	content , -, ability to select level of detail would be helpful
6.0	content , -, personal application is low; students do not understand how it helps them reduce their energy use
4.0	content , -, no personal tips / suggestions to reduce energy use
Usefulness	
6.0	usefulness , +, commit to conserve increases awareness about possibilities for energy conservation
5.0	usefulness , +, good source of information / good resource
1.0	usefulness , +, comparisons between buildings was most useful
5.0	usefulness , +, competition across all campus buildings/ dormitories is a good motivator
3.0	usefulness , -, personal lack of interest
2.0	usefulness , -, “would not use it unless had a project or purpose or assignment”
5.0	usefulness , -, “personal behavior can’t reduce energy use in public buildings”
3.0	usefulness , -, weather underground does not work
2.0	usefulness , -, page not loading
4.0	usefulness , -, information missing for some of the buildings ; content, -, some buildings don’t have any data

Table 6 – Usability Issues Lucid Dashboard

4.3.3 Usability Issues – Alerton Energy Dashboard

The following table enumerates the usability issues that were identified by participants throughout the task-analysis and post-test questionnaire.

# of participants who reported usability issue	Usability Issues - Alerton Energy Dashboard
Aesthetics & Graphics	
3.0	aesthetics & graphics , +, Cornell branding & color combination is appealing
3.0	aesthetics and graphics , +, graphs & text are legible & straightforward; color semantics are appropriate (i.e. for the color green & sustainability)

1.0	aesthetics & Graphics , +, background-grid (though not attractive) is useful; the background-grid allows to participants to differentiate between the days
2.0	aesthetics & graphics , +, images are attractive
2.0	aesthetics & graphics , +, finds icons arranged along the bottom helpful
5.0	aesthetics & graphics , -, poor color combination; greenish background is not appealing; red and black colors are too severe
1.0	aesthetics & graphics , -, 3D graph makes it hard to see
2.0	navigation , +, max & minimums of graphs are easy to read
1.0	aesthetics & graphics , -, it would be easier if you could zoom in and out of the graphs
1.0	aesthetics & graphics , -, icons too childish, don't convey confidence in information given;
1.0	aesthetics & graphics , -, bottom bar is grey and black – words seem like they are divided
3.0	aesthetics & graphics - poor font contrast, they are not legible; fonts are different on the left and right hand corners
3.0	aesthetics & graphics , -, poor graphic quality; graphic in the book under facts and definitions; image is cut off under <i>green facts</i>
5.0	aesthetics & graphics , -, background of the chart (green streaks) are very distracting; less visual clutter for a modern look (i.e. eliminate green streaks)
2.0	aesthetics & graphics , -, label at the top is repeated twice; there are two headings
5.0	aesthetics & graphics , -, too much information makes it difficult to focus on a single facet (too many menus, icons & labels - too much clutter)
Navigation	
4.0	aesthetics & graphics , -, scrolling & clicking overall should be eliminated. (i.e.. in the book) aesthetics & graphics , -, graph should be visible on a single screen; no scrolling should be necessary; scroll bars should be eliminated
4+/ 3-	navigation , +, cognitive map/ regions & landmarks- icons make it easy to recall where you are on the webpage
3.0	navigation , -, cognitive map- easy to find cooling, heating, electricity
3.0	navigation , -, did not notice the icons at the bottom right away; recommends making buttons the main focus; recommends making navigation icons at the bottom more prominent so they are the primary focus
2.0	navigation , -, can't zoom out; , having to scroll left and right, up and down

Content	
5.0	content , +, large green arrow make it easy to interpret the graphs; graphic is succinct and carries the point across
2.0	content , +, noticed second plug load energy consumption
1.0	content , +, finds mission statement helpful
2.0	content , +, scroll over features are nice; when you scroll over the bar graph it tells you what the content was at the moment
5.0	content , -, more explanation for the units is needed; doesn't know what plug load energy means
3.0	content , -, options on the side of the graph are very overwhelming (demand vs. consumption/ plug load energy); audience appropriateness of the terminology is low and little context is provided.
1.0	content , -, setting the calendar was annoying because the dates were limited and so it was very hard to set specific timescale
1.0	content , - scrolling bar at the bottom is very annoying; larger section dedicated to reducing energy use needed
1.0	content , +, unit equivalent is helpful for understanding the impact of one's energy use
1.0	content , +, units; found it very easy to navigate the energy dashboard
1.0	content , +, found it fairly easy to distinguish between daily, weekly, monthly, yearly tabs
1.0	content , +, it is easy to view the button that compares yesterday and today; the user found this comparison helpful
2.0	content , -, personal application – not enough tips that explain how to conserve energy
4.0	content , -, information should be organized topically to eliminate; scrolling & clicking, (easier for the content not to be set up like a book; the flipping motion is annoying)
3.0	content , -, the user feels that the floor plan diagram does not contribute much to the tab <i>floor plan</i> ; it shows a few professor's offices and laboratories but not much other than that
4.0	content , -, tab heading titles are extremely vague; (i.e.. "green facts" & "report" is a vague title .)
2.0	content , -, consumption does not change when units change
4.0	content , -, difficult to locate "unit equivalent" conversion tool
2.0	content , -, missing content; user presumes this might be faulty data (i.e.. video does not have any content) (one day in particular had very low energy use at 1am, the)

3.0	content , -, homepage; homepage has a slideshow of pictures; big idea should be present on homepage; trends should be explained
2.0	content , -, there should be some way to export information for the graphs without having to close and re-load another chart
2.0	navigation , -, more detailed information about energy conservation initiatives on campus are difficult to find ; these are difficult to find because the user is uncertain about what the appropriate location on the dashboard would be to find them
1.0	content , -, the user is trying to understand <i>why</i> energy is increasing/decreasing (i.e.. the weather) but was not able to figure it out.
1.0	content , -, the user is trying to understand <i>why</i> energy is increasing/decreasing (i.e.. the weather) but was not able to figure it out.
1.0	content , -, having a benchmark to compare current buildings' energy use against a "LEED" building that consumes less energy would be great
1.0	content , -, the user would like to see in the energy use trends over several years' time
1.0	content , -, finds the scale is very odd on the graphs that show dollar equivalent
1.0	content , -, wants to know what they mean by daylight harvesting – the user suggests that different levels of information could be given about the unique energy conservation features of a building; in this way, if someone wants to find out more about <i>why</i> a building is operating sustainably they would be able to do so. (i.e. Participants wish they had links or pop-ups because little explanation about specific energy saving features was made available under the green facts tab.)
1.0	content , -, unit equivalent do not provide a meaningful way of realizing how one might be able to change behavior and what energy use means
1.0	content , -, difference between demand and consumption should be highlighted
1.0	content , -, view chart under <i>floor plan</i> should either be more visible or the first thing that pops up on the front page
1.0	content , -, the scrolling 'energy tips at the bottom' are not very helpful; this feature would be more helpful if you knew which type of energy you were looking at and ways to reduce energy use
Usefulness	
4.0	usefulness , +, raises awareness about consumption trends & types of building energy use

2.0	usefulness , -, low usefulness; it does not give you a good idea of how to relate energy use to daily life & activities
1.0	usefulness , -, requires a lot of personal motivation to derive meaning from the website and to apply it to their lives to reduce energy use
3.0	usefulness , -, mission statement – needs to convey why this website would be useful at the personal level!!
1.0	usefulness , -, low personal interest; not a Human Ecology major
1.0	usefulness , -, should include information about other buildings on campus, in this way they might be able to make it relevant to people in other majors

Table 7 – Usability Issues Alerton Energy Dashboard

4.3.4 Results - Hypothesis 05

The qualitative responses from both the post-test interview and task-analysis were examined in order to determine the usefulness of the energy dashboard. Based on these qualitative responses, this study disproves hypothesis 05. Hypothesis 05 states that neither the Lucid Dashboard nor the Alerton Dashboard differ significantly in the way they build upon users' level of 'sustainable knowledge'. The Lucid Energy Dashboard was superior to the Alerton Dashboard in building upon participants' existing "sustainable knowledge". Specifically, 82.5% (33 correct of 40 total) of the responses analyzed across the Lucid treatment suggest that Lucid Energy Dashboard built upon users' 'sustainable knowledge'. Alternately, 47.5% (19 correct of 40 total) of the responses analyzed across the Alerton treatment suggest that it built upon users' "sustainable knowledge" (refer to Table 15 in the Appendix for more details).

5. DISCUSSION

First, the discussion section identifies statistically significant tasks across hypothesis 01, 02, 03 and 04. Second, usability issues are employed in order to explain the statistically significant differences. Specific features of each dashboard that either hindered or facilitated users' navigation experience are highlighted. In the following chapter, usability issues inform future design decisions through a series of 'Design Guidelines'.

Trends in statistical significance (across mouse-clicks and comprehension times) indicate Lucid Dashboard required greater effort as compared to Alerton. Despite apparent differences, equal success/failure was ultimately experienced in answering all tasks across treatment. The study concludes that the Lucid Dashboard requires significantly greater effort to locate answers across the majority of tasks than the Alerton Energy Dashboard. However, all participants were able to locate answers with equal proficiency across treatment.

5.1 Discussion - Hypothesis 01 (H01)

Statistically significant differences in number of mouse clicks for Q1, Q4, Q5 and Q9 suggest the Lucid dashboard requires more effort in order to complete the task. These findings contradict H01.

5.1.1 Hypothesis 01 -Task 01

Mouse-clicks were significantly different across dashboard treatment for task-item one. Participants using the Lucid Dashboard ($M = 33.25$, $SD = 21.51$) reported a

greater number of mouse clicks than participants across Alerton Energy Dashboard treatment ($M = 6.88$, $SD = 4.85$) ($p = 0.003$, $p < .05$ onetail). The following qualitative observations explain these statistical differences.

Task one assessed participants' ability to locate and interpret total electricity consumption over the past 24 hours in the Human Ecology Building. Qualitative observations explained statistical differences for mouse clicks across dashboard treatment. Multiple participants mentioned they had a difficult time navigating between the top and bottom sections of the Lucid Dashboard. These navigational differences were explained by the fact that the top (inter-building energy use) was not labeled as well as the bottom (intra-building energy use) section. For the top (intra-building energy use) feature, no "clue in" was provided to explain that images are clickable and show 'inter-building energy use trends'. Clearly labeled navigational tools should be utilized to eliminate possible confusion.

Lucid Dashboard participants felt that dividing a website in two sections created confusion. Participants expressed that a natural transition should exist between two sections with a similar purpose. Multiple participants navigated the incorrect dashboard section until they became frustrated and moved on to the next question. Therefore, if two applications can be opened simultaneously, guiding instructions should explicitly state the purpose of each section. Participants also expressed that the number of customizable options on the Lucid Dashboard became hindrance. Limiting the number of customizable options enhances the dashboards' ability to quickly communicate information. Participants expressed that elements of the Lucid

Dashboard's homepage must be improved to better communicate the overall mission of the website and its components.

Similar to the Lucid Dashboard, Alerton's homepage did not adequately communicate the overall purpose of the dashboard. A total of six (three Alerton and three Lucid) participants expressed the criticality of a homepage design. The homepage must provide participants with a clear idea of what kind of information they should expect. Navigation features clearly visible across the bottom of the Alerton Dashboard made navigation more intuitive. However, participants expressed these navigational features could be further emphasized. It was observed that once participants located the main navigational tools, they were able to quickly differentiate between energy sources (heating, cooling and electricity). According to participants, clearly labeled icons/tabs made it easier to navigate the dashboards. The 'total energy' tab created some confusion and resulted in several incorrect answers.

Usability issues gathered from participant interviews revealed that the Lucid dashboard required more mouse clicks because it carried the added task of displaying both inter-building and intra-building energy consumption trends. On the other hand, the Alerton dashboard displays energy trends across a single building.

5.1.2 Hypothesis 01 -Task 04

Mouse-clicks were significantly different across dashboard treatment for task-item four. Participants using the Lucid Dashboard ($M = 19.88$, $SD = 31.38$) reported a greater number of mouse clicks than participants across Alerton Energy Dashboard treatment ($M = 1.75$, $SD = 1.39$) ($p = 0.003$, $p < .05$ onetail). The following qualitative observations help explain these statistical differences.

To complete task four, participants had to identify the highest period of cooling energy over the past year. Observations reveal that most participants utilized the custom period function at the bottom of the screen. In using the custom period toolbar, participants experienced significant difficulty. Several participants selected the wrong period of time. Furthermore, monthly data for the Lucid Dashboard was available for only two months of the entire year. Participants believed this was a navigational error. To verify their results, participants spent a considerable amount of time resetting the custom settings. Lucid Dashboard participants expressed the custom period function was the greatest navigation-obstacle.

5.1.3 Hypothesis 01 -Task 05

Mouse-clicks were significantly different across dashboard treatment for task-item five. Participants using the Alerton Energy Dashboard ($M = 9.50$, $SD = 3.74$) reported a greater number of mouse clicks than participants across Lucid Dashboard treatment ($M = 11.50$, $SD = 21.31$) ($p = 0.003$, $p < .05$ onetail). The following qualitative observations help explain these statistical differences.

Task five investigated the ability to locate & interpret the highest period of ‘steamed water consumption’ within the last month (in the Human Ecology Building). This was the only task for which the Alerton Energy dashboard required a greater number of mouse-clicks as compared to the Lucid Dashboard. By task five, participants had more experience using the dashboard interface. They had already answered four energy-related questions and gained familiarity with a dashboard’s navigational features. Participants expressed greater confidence in distinguishing

between energy-sources over a selected period of time. Participants were also able to quickly identify the “today, this week, this month, this year” buttons.

The Alerton dashboard required more mouse clicks because participants had to scroll through the graph in order to compare maximum vs. minimum energy consumption trends. At this stage several participants expressed confusion regarding the concepts ‘demand’ and ‘consumption’. These participants searched for the meaning of “demand” vs. “consumption” resulting in a greater number of mouse clicks.

5.1.4 Hypothesis 01 -Task 09

Mouse-clicks were significantly different across dashboard treatment for task-item nine. Participants using the Lucid Dashboard ($M = 10.25$, $SD = 5.68$) reported a greater number of mouse clicks than participants across Alerton Energy Dashboard treatment ($M = 3.36$, $SD = 5.07$) ($p = 0.003$, $p < .05$ onetail). The following qualitative observations help explain these statistical differences.

Task 9 asked students to identify one energy-conservation tip provided by the dashboard interface. This question analyzed a dashboard’s ability to build upon students’ existing sustainable knowledge of energy use practices.

Alerton Dashboard participants did not find the ‘scrolling text’ at the bottom of the page to successfully convey energy conservation tips. Transcribed interviews revealed that many participants overlooked this feature. A significant number of participants commented that Alerton’s ‘scrolling text’ was ‘annoying’. Overall, the audience did not believe enough space was allocated to suggestions for personal

energy conservation. Multiple participants claimed that number of items vying for attention across the bottom, horizontal axis were overwhelming.

Alternately, Lucid Dashboard participants were able to identify energy conservation tips on the homepage. Participants noted that the ‘commit to conserve’ tips were obscured by multiple ‘widgets’. However, appropriate use of color-hierarchy made them stand out. The majority of participants across both dashboards need to dedicate more space to energy conservation tips. These tips must convey how ‘sustained conservation behaviors’ can reduce campus wide carbon emissions.

5.2 Discussion - Hypothesis 02 (H02)

Overall, statistical differences in answering times were different across Q2 & Q7. These differences suggest that the Lucid dashboard requires more effort to complete a task compared to Alerton. In the following paragraph we explain what kinds of usability issues were faced across each task.

5.2.1 Hypothesis 02 - Task 02

Answering times were significantly different across dashboard treatment for task-item two. Specifically, students using the Lucid Dashboard ($M = 1.81$, $SD = .60$) reported a greater number of mouse clicks than participants across Alerton Energy Dashboard treatment ($M = .91$, $SD = .52$) ($p = 0.003$, $p < .05$ onetail). The following qualitative observations help explain these statistical differences.

Task 02, investigated the highest period of electricity consumption in Human Ecology Building within the past 24 hours. It was important to note that many of the usability issues encountered across task 01 were also present across task 02.

Multiple participants expressed difficulty navigating between the top & bottom sections of Lucid Dashboard. Multiple participants claimed that no visual “clues” suggested the images were clickable. Lucid dashboard users had a difficult time navigating between the top (intra-building comparison) and bottom (inter -building comparison) sections. This is because the top energy use section was not as well labeled as the bottom section. To provide appropriate guidance, a brief instructional phrase such as ‘select your building under this section’ was missing. Furthermore, participants became immersed in the bottom section. The “custom period function” proved to be an obstacle for navigation. Participants took several minutes to understand how to use the custom period function. Alternately, the Alerton Energy Dashboard quickly distinguished between the highest and lowest periods of energy consumption. The Alerton Dashboard provided an option to compare energy trends against the past 24 hours. This button was clearly visible and easy to use. Furthermore, a large green arrow quickly conveyed whether energy use had either increased or decreased over time. Therefore, participants exposed to the Alerton Dashboard treatment took significantly fewer mouse clicks to answer Task 2.

5.2.2 Hypothesis 02 - Task 07

Answering times were significantly different across dashboard treatment for task-item seven. Specifically, students using the Lucid Dashboard ($M = 5.43$, $SD = 3.23$) reported a greater number of mouse clicks than participants across Alerton Energy Dashboard treatment ($M = 1.84$, $SD = .73$) ($p = 0.003$, $p < .05$ onetail). The qualitative observations below explain these statistical differences.

As aforementioned, task seven was different across treatment. Participants using the Alerton and Lucid dashboard treatments identified unique energy conservation features respective to the task-at-hand. Participants using the Lucid treatment located ‘the percent reduction in energy use for campus cooling due to lake source cooling’.

Task seven investigated features unique to each dashboard. Task seven first examined Lucid Dashboard participants’ ability to locate, read and interpret the sustainability tab (describes sustainability initiatives employed throughout Cornell’s campus such as Lake Source Cooling Plant). This task also evaluated Alerton Dashboard participants’ ability to locate end-source energy consumption (specifically the lowest point of second floor plug load energy consumption within the past 24 hours).

Lucid Dashboard participants recurrently affirmed the tab title ‘sustainability’ was too broad. A vague title made it difficult to understand the purpose of a section. The layout also caused confusion. Participants misunderstood that the ‘sustainability’ to be a photo gallery. Few individuals noticed the paragraph text at the bottom of the page. These individuals believed the paragraph text was ‘too long-winded’. As a result, the researcher concluded that information must be broken up into layers (i.e. a header, catch phrase and the option for more detailed information). This task also emphasized the need for alternate ‘media’ (i.e. audio & visual aids). The aforementioned observations stress the criticality of layout and composition. The transcribed interviews suggest that most participants did not scroll to the bottom of a page, making important information easy to miss. Transcribed interviews also

revealed that participants become sidetracked when external links are located on the dashboard's homepage. Furthermore, multiple participants expressed significant frustration that a "search bar" was not available for general terms (only buildings were searchable).

Across the Alerton Dashboard participants mentioned that plug load energy consumption should be accessed under multiple tabs including: electrical energy, heating, cooling and under the comparisons tab. Users became familiar with the 'left hand side selection pane' making it easier to find this question. However, participants frequently verbalized how inconvenient and frustrating it was to scroll across these options. Subsequently, scrolling should be eliminated wherever possible.

Although participants were able to identify 'plug load energy consumption' they found the terminology was obscure. Other participants were overwhelmed with the number of options and accidentally selected the incorrect answer (i.e. first floor electricity consumption vs. second floor plug load consumption). Therefore, it is critical to filter details depending on the user-group.

5.3 Discussion - Hypothesis 03 (H03)

No statistical differences were present in the number of 'successful vs. unsuccessfully' completed tasks for tasks Q1-Q9 across treatment. These findings contradict H03, which hypothesized that the Alerton Energy Dashboard would have a greater number of successful vs. unsuccessfully completed tasks. Due to a lack of statistical significance across treatment, we accept that participants were able to complete tasks with the same rate of success for Q1-Q9.

5.4 Discussion - Hypothesis 04 (H04)

The number of unanswered tasks is designed to provide insight into the degree of difficulty in answering a question, beyond ‘successfully vs. unsuccessfully’ completed answers. For outcome-measure four, there were no statistical differences across dashboard treatment. Therefore hypothesis four was refuted. The researcher believes this lack of statistical significance across this measure is the result of a small sample size (n=16). For this reason, it is important to examine the results in closer detail. The chart below displays ‘total number of unanswered tasks’ across treatment.

As shown below, one in eight participants exposed to the Lucid treatment skipped tasks Q3, Q6 and Q7. Of eight participants exposed to the Alerton treatment, one skipped task Q1 and three participants skipped task Q7. Only Q7 was left unanswered by more than one participant. Therefore, interface design features associated with Q7 represented greater navigational barriers than across all other tasks.

Task-Item	Alerton Energy Dashboard # unanswered (n=8)	Lucid Dashboard # unanswered (n=8)	Total # unanswered (n=16)
Q1	0	1	1
Q2	0	0	0
Q3	1	0	1
Q4	0	0	0
Q5	0	0	0
Q6	1	0	1
Q7	1	3	4
Q8	0	0	0
Q9	0	0	0

Table 8 - Usability Issues present across Hypothesis 04, Tasks Q1-Q4

5.5 Discussion – Overview of Findings

5.5.1 Hypothesis 01 & 02

Contrary to hypothesis 01 and 02, data collected in this study indicates that the Lucid Dashboard required a greater amount of time and number of mouse-clicks across all significantly different tasks, except task five. The amount of time to complete a task and number of mouse clicks are widely known to represent objective and measurable criteria for an interface's user-friendliness. (Shneiderman & Plaisant, 2005) Mouse clicks across tasks Q1, Q4, Q5 and Q9 were significantly different for each dashboard treatment. Time was also significantly different for tasks Q2 and Q7. It is important to note that significantly different tasks for mouse-clicks do not mirror tasks that are significantly different for time (refer to Table 9 below or Appendix, Tables 11-14). For example, while time was significantly different for task Q1, mouse-clicks were not. This trend is repeated across tasks Q1, Q2, Q4, Q7 and Q9. Such findings might indicate that some tasks require more time to interpret content (comprehension time) and other tasks require more effort to locate the correct answer (mouse-clicks). However, the mean time (comprehension time) and mean number of mouse clicks (effort) for each task was higher for the Lucid dashboard across the majority of statistically significant and non-statistically significant tasks (refer to Appendix, Tables 11-14). Further studies should investigate how the 'level of engagement' mediates the time and mouse-clicks to complete each task.

Presence of Statistical Significance Across Task

Task	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9
Time	LD>AD* (p=0.003)	-	-	LD>AD* (p=0.021)	LD>AD** (p=0.028)	-	-	-	LD>AD* (p=0.028)
Mouse Clicks	-	LD>AD* (p=0.000)	-	-	-	-	LD>AD* (p=0.015)	-	-

<p>*LD>AD = Lucid is Statistically Greater **AD>LD = Alerton is Statistically Greater - = No Statistical Difference Across Treatment</p>
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Table 9 - Presence of Statistical Significance Across Task Q1-Q9

Participant responses to post-test interview question 10 were analyzed to better understand how characteristics of engagement vary across the two dashboard treatments. Seven out of eight Lucid Dashboard participants stated they were positively engaged by the Lucid Energy Dashboard. Four out of these seven participants attributed their level of engagement to the dashboard's interactive features and/or the animations. The single remaining participant did not provide a verbal response but did circle 'agree'.

Only two of eight Alerton Dashboard participants stated they were engaged. Both participants affirmed the dashboard's interactive features were responsible for their engagement. Four Lucid dashboard participants were 'neutral', neither significantly engaged nor disengaged. The two remaining participants responded they did not find the dashboard to be engaging. All six 'neutrally engaged' and 'dis-engaged' participants confirmed that 'too much content' or the type of content was responsible for their lack of engagement.

Overall, Lucid dashboard participants self-reported positive levels 'engagement' more often as compared to Alerton dashboard participants. These findings suggest that self-assessed 'level of engagement' might be correlated to time (comprehension time) and mouse-clicks (effort) spent searching for an answer. However, these findings are inconclusive. Further research is necessary to understand whether 'level of engagement' mediates outcome-measures time and mouse-clicks.

The ability to understand how 'level of engagement' influences dashboard usability is one limitation imposed by the current scope of this study. O'Brien and Toms (2008) define engagement as a multifaceted quality of user experience characterized by attributes of challenge, positive affect, endurability, aesthetic and sensory appeal, attention, feedback, variety/novelty, interactivity, and perceived user control. 'Engagement' as defined by O'Brien and Toms (2008) is a multifaceted notion that cannot be addressed within the time and resources limitations of this study. However, this is an important variable because engagement is a desirable characteristic of any environmental education intervention. The researcher believes that 'level of engagement' is important because it is a possible mediator of the amount of time and number of mouse-clicks an individual chooses to expend looking for an answer. According to O'Brien and Toms (2008) an engaging user experience is characterized by the ten aforementioned attributes. Therefore, understanding which of these attributes are fulfilled by the energy dashboard could further explain statistical differences in the amount of time and mouse-clicks necessary to locate an answer.

Usability Issues

Objective measurements such as mouse clicks and task completion time provide limited information about the task-context in which participants' actions were carried out. Therefore, usability issues provide insight into the features of each dashboard that either facilitated or hindered dashboard navigation and the completion of tasks. (Chi et al., 2001)

Multiple usability issues were extracted from transcriptions of the task-analysis and post-test interview. The four categories are: 1. Aesthetics and Graphics, 2.

Navigation, 3. Content, and 4. 'Usefulness'. The next four paragraphs briefly review the most commonly cited usability issues.

In the category of aesthetics & graphics, three usability issues were most commonly cited: icons, color combination and amount of information available on a dashboard page. Five of eight Lucid dashboard participants asserted that the icons positively contributed to the design of the website. Comments declare the icons are attractive, approachable and facilitate website navigation. On the other hand, five of eight Alerton dashboard participants negatively commented on the dashboard's poor color combination. The participants found that the 'severe' choice of red, black and green for the dashboard's color scheme was unattractive. Together, ten participants (five Alerton and five Lucid participants) found the amount of content on a single page was 'overwhelming'.

Significant navigational barriers were encountered by both Lucid and Alerton dashboard participants. Five of eight Lucid Dashboard participants felt uncertain of how the top half of the website (for intra-building comparisons) related to the bottom half (for inter-building comparison). Multiple participants stated that having two applications open at once caused significant confusion. This added burden of comparing energy across multiple buildings was observed to cause significant confusion among Lucid participants while searching for an answer. Despite this navigational barrier, five of ten Lucid dashboard participants expressed that a consistent layout contributed to a strong cognitive map. 'Cognitive map' is a concept that describes participants' ability to build a mental map of where different kinds of information are stored on a website or interface. Although participants did not use the

term ‘cognitive map’, they commented on the dashboards’ layout in facilitating task-completion. (Lynch & Horton, 2011) However, when the layout of the website changes from page to page, it becomes more difficult to build this ‘mental map’. (Lynch & Horton, 2011) Lucid dashboard participants explained that the location of the ‘unit conversion tool’ and other features were not consistent across pages of the dashboard. According to multiple participants, the layout’s lack of visual consistency made it difficult to quickly locate information across the Alerton dashboard.

Alerton dashboard participants also expressed significant frustration with navigational tools. Multiple participants commented that the main navigation icons at the bottom of the screen should be made the primary focus. Participants expressed significant frustration with the scroll-bars. Four of eight Alerton participants believe that making the graphs visible on a single would eliminate confusion caused by the ‘scrolling’ feature.

Within the categories of content and ‘usefulness’, participants’ comments emphasize a lack of personal relevance provided by the dashboard. Five of eight Lucid dashboard participants felt that the content did not suggest how individual actions personally effect energy consumption in public buildings. Three of eight Lucid participants believe the homepage needs to convey why the website is useful at a personal level. Lucid dashboard participants also emphasize that more explanation/context for the energy units is needed. To improve the usability of energy dashboards, 'Design Guidelines' are outlined in the subsequent ‘recommendations section’. This section provides a detailed list of guidelines and recommendations to resolve critical usability issues.

5.5.2 Hypothesis 03 & 04

According to hypothesis 03 and 04, the Lucid Dashboard was predicted to have a greater number of successfully answered task-items and fewer skipped task-items. Contrary to hypothesis 03 and 04, no significant differences were found in the number of successfully answered questions or in the number of 'skipped' questions. This lack of significance is explained by the fact that a strict time-limit to complete each task was not enforced. It was recommended that participants spend 25 minutes completing the post-test questionnaire. However, participants continued searching for a correct answer until they chose to move on to the next question.

6. RECOMMENDATIONS

This section provides design guidelines and recommendations to improve the product-user fit. Without proper user-product fit, significant barriers to the effective use of an energy dashboard often result. This section provides a set of design guidelines and recommendations to improve the product-user fit of these important energy conservation tools. Recommendations are based on the results this study and are broken up into three primary categories: 1. Content, 2. Aesthetics and Graphics, and 3. Navigation. These encompassing categories were determined to be critical facets of energy dashboards' design through research and focus groups.

6.1 Dashboard Goals

The recommendations below emphasize the dashboard's goals:

1. Create a flexible energy dashboard design for multiple user-audiences.
2. Go beyond data reporting and inform building users of sustainable building practices.
3. Generate opportunities for student learning and engagement with on-campus buildings.

6.2 User-Audiences

Each dashboard user approaches the environmental education intervention with a unique background and objective. Therefore, their individual needs must inform the dashboard features. In the following section we briefly describe the five(I only see

two) primary user-audiences. The feedback generated from a student demographic was expanded to encompass the five (?) primary dashboard users. This section briefly outlines each dashboard users' needs.

Audience	Technical - Pre-professional Student	Novice - Outside Audience
Time Commitment	high	low
Preferred Format	report	synthesis
Behavior	data-mining	browsing
Message	allows for interpretation	scripted recommendations
Degree of Detail	detailed	general
Interface	tailored	tailored

Table 10 – Dashboard

6.2.1 Student Body

The general student body is less invested in building energy performance standards and has less time to commit to graph-interpretation. Overall, the dashboard should engender greater public understanding of the variables that influence sustainability in buildings. At the same time, the dashboard must communicate information quickly. To do this it must support browsing behavior, synthesize information and provide scripted recommendations.

6.2.2 Undergraduate Pre-professionals [facility managers, interior designers, architects]

Pre-professional students have a stronger technical background and familiarity with building energy-use trends. Due to their specialization, they prefer a greater level of

detail. Pre-professional students are also more likely to browse the dashboard for a class projects or research. Therefore, this interface should allow for comparison across detailed reports. Pre-professional students, however, are less experienced compared to expert facility managers. Therefore, the dashboard should provide pre-professional students more guidance to successfully complete a task.

6.3 Recommendations

6.3.1 Content Guidelines

Content guidelines I, II, III, IV & V are tailored toward a general undergraduate and graduate student demographics. Content guideline VI is tailored toward the pre-professional student demographic.

6.3.1.1 Guideline I

Tailor energy dashboard content to the audience's level of knowledge.

Guideline I - Recommendation 1

The dashboard must provide a standardized benchmark to compare 'good' vs. 'wasteful' building energy use.

- Display energy as a percent to convey efficiency compared to the chosen benchmark.
- Use available information. The benchmark should be adapted to the type of information available.
- Possible benchmarks include buildings within the same climate zone, state or across Ivy League Universities.

- Benchmarking against the same building is also possible. Energy-savings should be compared to the buildings' historically optimal performance. If this benchmark is used, the dashboard must communicate specific efforts to optimize energy-use. For example, during very hot days power outages are experienced due to excessive cooling demands. At times, when demand for cooling/heating must be lowered, the energy dashboard can communicate energy savings to the community. Occupants are more likely to temporarily accept a wider temperature range if energy-saving benefits are emphasized.
- It is recommended to provide the benchmark across a smaller rather than a larger group of universities. Building occupants are more likely to become competitive if they can compare their energy use against a smaller pool of universities (of similar academic ranking).

Guideline I - Recommendation 2

The dashboard must provide energy metrics that are easier for a non-expert audience to relate to. Units must be selected based on audiences' expertise. Six types of unit-comparisons are recognized as critical.

- A standard unit of electricity production or consumption (i.e. Btu/kWh). It is important to include a standard rate of electricity use for those interested.
- A unit of energy representing the environmental impact of the energy (i.e. a measure of carbon dioxide emissions).
- A measure of energy that individuals easily remember (i.e. amount of CO₂ sequestered by a 10 acre forest or amount in dollars). This measure must make sense to people regardless of how small or large it is.

- Ability to filter building energy per square foot. This filter standardizes energy consumption across buildings regardless of size.
- Ability to filter building energy-use per person. This filter highlights the effect human occupancy-rates on a building's energy efficiency.
- For less-expert audiences, only provide total consumption. For more advanced audiences, clearly distinguish total from hourly consumption.

Guideline I - Recommendation 3

The dashboard must provide an appendix. This section must familiarize users with key terms and explain energy-related terminology. Terms should be organized categorically and alphabetically.

Guideline I - Recommendation 4

Varying levels of information should be available. In this way users have the option to learn more about a particular feature if they choose to do so. Three 'levels of information' should be available for each tab: a main title, a tag line and an optional in-depth explanation (pop-up explanation for charts & graphs). In this way users have the option to browse or learn about a particular feature in depth.

- Main Title: Describe the overall purpose of a category with a descriptive header or catch phrase (i.e. energy & sources, comparisons, competitions, Cornell initiatives)
- Tag line: Provide a few sentences regarding the importance of the content.
- In-depth explanation: Two or three sentences provide in-depth explanation. This explanation should be optional (can be minimized). For detailed charts & graphs, provide a pop-up with brief explanation of relevant trends.

6.3.1.2 Guideline II

Present information using varied media choices to lessen cognitive loads.

Guideline II - Recommendation 1

Sections that have lengthier explanations should use alternate types of media. Employ audio-visuals, info-graphics and images to lessen the site's cognitive demand.

Guideline II - Recommendation 2

The energy dashboard must account for varied learning preferences. The dashboard must allow for flexible learning by providing a choice of two viewing-experiences.

To allow for interactive learning without information-overload, provide two ways of interpreting a single piece of information. For example, instead of a detailed graph, display the total numerical value and an alternate visualization of this amount (infographic). This option should only be present for the two most vital energy dashboard features.

Guideline II - Recommendation 3

The energy dashboard may employ visualizations (infographics) to display the environmental impact of energy savings in a more concrete way. (Expand)

6.3.1.3 Guideline III

The energy dashboard must use campus buildings as a platform to educate the community (outside audiences and the general student-body) about building energy-use.

Guideline III - Recommendation 1

The dashboard homepage must provide the mission statement and communicate the dashboard's key points. The homepage content must not compete with the mission statement. (For example?)

Guideline III - Recommendation 2

The dashboard must display key energy consumption metrics (electricity/heating/cooling) as streamlined energy-meters. The energy-meters must provide key metrics and communicate building-efficiency in comparison to a stable benchmark for less technical audiences.

Guideline III - Recommendation 3

The energy dashboard must compare energy use across multiple buildings. Comparisons should make it easy to showcase high performing buildings. The ability to compare energy must also spur competition for increased performance.

Guideline III - Recommendation 4

A dedicated section must explain the variables that impact building energy efficiency. Specifically, the implications of occupant behaviors, construction features & materials, facility management-strategies, and outside temperature should be explained. When a 'green' feature is added/subtracted, a meter must add/subtract kilowatt-hours, carbon dioxide emissions or money from the building's footprint.

Guideline III - Recommendation 5

The dashboard must dedicate a section to explain Cornell's primary energy sources (electricity, heating and cooling). Students should have an option to learn where the energy to heat/cool/power campus buildings comes from. Specifically, alternate media

(video or audio) can explain how ‘Combined Heating & Cooling’ and ‘Lake Source Cooling’ result reducing campus-wide emissions.

Guideline III - Recommendation 6

The dashboard must communicate the costs vs. benefits of choosing alternative energy providers. The goal is to empower students to become conscious energy consumers.

Guideline III - Recommendation 7

The dashboard should allow students to visualize energy savings in the context of their dormitory, apartment or lab. A simple image of a laboratory/dorm/apartment with scroll-over features identifies opportunities for minimizing energy savings. Mouse-scroll-over effects reveal the energy savings of specific actions (i.e. such as turning off lights when away or eliminating personal mini-fridges).

6.3.1.4 Guideline IV

The dashboard should contextualize opportunities for energy savings within physical space and time.

Guideline IV - Recommendation 1

The floor plan feature must be available to communicate end-use performance in specific spaces (graduate labs, research labs, computer labs, common areas). In academic buildings, the positive environmental impact of small actions to reduce energy over time must be communicated (i.e. savings obtained by eliminating elevator-rides, turning off lights during sunny days and minimizing water heating and plug load savings can be identified).

Guideline IV - Recommendation 2

Locate the energy dashboard in main entryways or paths of academic buildings. The display should provide a 3-meter (electricity, heating & cooling) overview of energy trends. The display should post reminders of small energy-saving actions that have a cumulative environmental impact.

Guideline IV - Recommendation 3

Locate the energy dashboard in main entryways or common rooms of residential dorms. The display should provide a 3-meter (electricity, heating & cooling) overview of energy trends. The display should track energy savings per-floor. The energy monitor should demonstrate % savings of resource-consumption per floor. Breaking up energy consumption per floor makes it easier to track energy-costs of shared facilities.

6.3.1.5 Guideline V

Increase opportunities for dialogue between campus facility-management teams and the university community.

Guideline V - Recommendation 1

The energy dashboard must increase communication between facility managers and the campus community. Allow facility managers to ‘post’ space-specific energy-conservation tips on the floor plan feature. This feature should allow building occupants to commit to small, measurable energy-saving goals. Percent-savings may be calculated over time (i.e. committing to using natural light). Inquiries for the facility management team can also be submitted in this section.

Guideline V - Recommendation 2

The energy monitors located in main entryways should communicate facility-management conservation actions. Occupants are more likely to accommodate to a wider temperature-range if they understand *why* the change was necessary. For example, on extreme weather days, demand for heating/cooling increases dramatically throughout the campus. To avoid power-shortages, it is wise for facility managers to limit the amount of energy that is expended by buildings. (Zakaria, 2013) It is important to communicate possible energy-savings obtained by operating few degrees above/below the ‘optimal temperature range’. Allowing building occupants to be included in ‘facility-wide decisions’ will give them a sense of ownership. It is also a reminder that energy savings continue to be a priority in public spaces. Global citizenship begins with small conscious behaviors.

6.3.1.6 Guideline VI

Facilitate collaboration between undergraduate pre-professional students and facility management with the goal building an inventory of ‘energy efficient design interventions’.

Guideline VI - Recommendation 1

The energy dashboard should engage pre-professional students through related campus courses. Cornell is committed to becoming a ‘living-learning laboratory’ for sustainability. It is important to emphasize the importance of sustainable building practices by encouraging pre-professionals to identify materials and design features that result in more efficient buildings

For expert users (pre-professional students), the energy dashboard should enable detailed comparisons across a wide range of variables. This implies the ability to break down energy use by building space (first and second floor levels) and end-use (ventilation, heating & cooling, lighting, plug-load, elevators) and intervention (design intervention, management technique, heating or cooling method and across behavior change campaigns). As compared to facility managers, pre-professional students would need more guidance and a user-friendly interface.

Guideline VI - Recommendation 2

The energy dashboard should allow file sharing between pre-professional students and facility managers. Access to a detailed inventory of construction features, building renovation records, facility management techniques and behavior change campaigns should be possible. In this way, students can compare data before and after an intervention. The inventory will also help Cornell verify what variables are influencing energy performance across buildings.

Guideline VI - Recommendation 3

The energy dashboard should allow expert users to bookmark, export, and make annotations onscreen. This facilitates the ability to generate and share reports across user groups.

6.3.2 Navigation Guidelines

6.3.2.1 Guideline I

Quicken users' cognitive mapping of main navigational tools. (A cognitive map is a mental map or model.)

Guideline I - Recommendation 1

Emphasize the main navigation-tabs through color and highlighting. Employ color to distinguish between ‘regions of the website’ and bookmark the section you are currently on.

Guideline I - Recommendation 2

Emphasize main-navigation tabs on the homepage. The homepage and other main-navigation tabs must be clearly visible regardless of where you are on a website.

Guideline I - Recommendation 3

The dashboard must emphasize the most important sections of the dashboard by reducing the number of tabs on the main menu. It should provide fewer tabs (of appropriate vertical length) in order to reduce visual clutter and focus attention. To reduce clutter the dashboard may also break up tabs that are excessively long (in the vertical direction) by nesting related content beneath sub-tabs.

Guideline I - Recommendation 4

Use representative icons to aid navigation and improve recall where appropriate.

Guideline I - Recommendation 5

Tab adjacencies and sub-tab adjacencies should be determined based on information-hierarchy. Tabs of greater importance should be more visible and readily accessed as compared to less critical information.

6.3.2.2 Guideline II

Facilitate the search-ability of the website.

Guideline II - Recommendation 1

Provide a search bar on the main menu and allow key-term searching. The appendix should provide detailed explanations for unfamiliar/advanced terminology.

Guideline II - Recommendation 2

Provide ‘links’ for definitions/explanations of key terms.

6.3.2.3 Guideline III

The purpose of dashboard applications should be intuitive for first-time users.

Guideline III - Recommendation 1

Limit the number of applications that can be opened at once. If more than one application can be opened at once, it should be easy to tell the difference between them. The lack of clear instructions explaining the purpose of each section is (i.e. intra-building vs. inter-building comparisons) caused significant confusion.

Guideline III - Recommendation 2

Provide ‘supporting’ instructions that explicitly guide new users through tasks to avoid confusion. A script provides guidance for more complicated features in dashboards tailored toward professional facility managers.

Guideline III - Recommendation 3

The entire graph must be visible at a glance. Eliminate the need for scroll bars.

Guideline III - Recommendation 4

The dashboard must eliminate the custom-period function of energy-consumption for non-expert audiences. The number of customizable options introduced by the ‘custom period’ function can be overwhelming for novice dashboard users.

6.3.3 Aesthetics & Graphics Guidelines

6.3.3.1 Guideline I

The dashboard must employ appropriate (explain) use of color.

Guideline I - Recommendation 1

The energy dashboard must usefully employ color semantics that are culturally and contextually relevant. For example...

Guideline I - Recommendation 2

The dashboard must allow for visual rest and create areas of ‘white-space’.

6.3.3.2 Guideline II

The dashboard must employ appropriate (explain) use of text. (font, size, spacing, links)

Guideline II - Recommendation 1

The energy dashboard must use appropriate text-background contrast and resolution to ensure legibility. Avoid equiluminant colors.

Guideline II - Recommendation 2

The dashboard must create an appropriate typographical framework for titles, body, annotations and accent text. Titles must distinguish sections of the website. Body should be clean and legible. Annotations are appropriate for notes. Accent text must highlight important information. To create visual cohesion, use the same text family, but vary size for the titles, body, annotations and accents. Use a different color and/or bolding for accent text.

Guideline II - Recommendation 3

Large blocks of text should be avoided. Instead break up lengthy text-based explanations into bullet points and assorted media (animations and audio-visuals).

6.3.3.3 Guideline III

The dashboard charts must communicate content clearly and concisely.

Guideline III - Recommendation 1

The dashboard must eliminate redundant elements and graph labels.

Guideline III - Recommendation 2

The dashboard must avoid three-dimensional features. Three-dimensionality adds a layer of complexity to the image, requiring more time to accurately process information (by the computer or by the user. If it is the former, this could change with new technologies. If it is by the latter, it will not change).

Guideline III - Recommendation 3

The x & y-axis must be clearly labeled on all charts to avoid confusion. Several participants mistakenly wrote down the wrong month for various tasks because the x & y axis were not clearly labeled.

Guideline III - Recommendation 4

The chart content must be organized to express meaning (i.e. categorically or from maximum to minimum). Users are able to derive meaning more easily if information is 'sorted' accordingly.

Guideline III - Recommendation 5

The dashboard must support a modern, streamlined look by eliminating unnecessary lines, colors, textures, icons and other visual clutter.

6.3.3.4 Guideline IV

The dashboard layout must create visual cohesion.

Guideline IV - Recommendation 1

The energy dashboard must utilize the layout to emphasize important content. Be sure to locate important elements on the top right-hand corner (western readers start at the top left) . Arranging unit conversions and customization options along many different axes results in significant confusion.

Guideline IV - Recommendation 2

Create visible structure by utilizing a layout grid and locating key elements in the same place across dashboard pages.

7. CONCLUSION

7.1 Conclusion

Overall, this study contributes to our understanding of energy dashboard interface design through two research objectives. First, the dashboards' 'usability' among university students was determined. Second, we determine differences across dashboards' ability to build on participants' 'sustainable knowledge of building practices'. The ultimate goal of the quantitative and qualitative data gathered is to create a more 'useful' environmental education intervention tailored to university audiences.

The dashboards represent two typical interface designs used widely by universities throughout the country, the Alerton xxx and the Lucid xxx. Of the two, Lucid represents the more commercially available dashboard option. More than seventy universities throughout the United States adopted the Lucid Dashboard product. (Lucid, 2013). Alternately, Alerton's target audience is spread across multiple commercial sectors and universities only represent a small percentage of its total clientele. (Alerton Dashboard, 2013) Furthermore, Lucid Dashboard communicates campus-wide energy savings (across multiple buildings) while Alerton focuses on a single building.

The findings of this study indicate that the Lucid Energy Dashboard presents significantly greater usability obstacles as compared to the Alerton Dashboard. Average time to complete a task was found to be greater for the Lucid dashboard across the majority of significant and non-significant tasks (refer to Appendix, Tables 11-14). The average number of mouse clicks needed are also greater for the Lucid

Dashboard across the majority of tasks (refer to Appendix, Tables 11-14). A cross-comparison of quantitative and qualitative findings reveal the Lucid Energy Dashboard requires more effort to navigate because it has two applications that are open at once. However, the Lucid Dashboard allows for inter-building and intra-building comparisons, something the Alerton does not do.

While the participants mention that it is very valuable to compare energy across multiple buildings, qualitative data suggests it is easier to navigate the Alerton Dashboard because it is focused on a single building. Qualitative and quantitative findings present two separate perspectives for the ideal dashboard. One explanation for students' desire to access a large amount of information on a single application is Generation Y's familiarity with the Internet. Participants in this study belong to Generation Y and are mostly college age students between 19 and 29 years of age. Despite this apparent conflict, it is necessary to streamline the dashboard's content to quickly and effectively communicate how an individual can have a personal effect on a building's energy efficiency. The recommendations provided in this study do not recommend that every facet of the dashboard be made available on the same interface. Instead some information should only be displayed in academic and residential building entrances, while additional material can be made available online.

Qualitative responses suggest the Lucid design (representing a commercially available dashboard option) was superior to the Alerton design in its ability to build upon participants' existing sustainable knowledge. The Lucid design is successful because it provides a dedicated section to communicate personal energy conservation tips. This section is called 'commit to conserve' and is highlighted on the homepage.

Alternately, the Alerton design restricts energy dashboard recommendations to a scrolling news ticker at the bottom of the screen. As evidenced by this study, the method in which energy conservation tips were displayed had a strong influence on a dashboard's ability to build upon participants' existing sustainable knowledge.

The quantitative and qualitative measures employed by this complement each other. Quantitative measures provide an objective measurement of comprehension time, effort and the success rate of completed tasks. Additionally, qualitative measures of usability provide further insight into the task-context and subsequent features that hinder or enable task-completion. Together qualitative and quantitative data offer a more holistic understanding of dashboard features that either hinder or enable usability and learning.

7.2 Future Research

Future research must investigate whether an energy dashboard focused on a single building's energy efficiency is more effective than an energy dashboard which provides information across multiple buildings. While qualitative interviews emphasize inter-building comparisons to be an important feature, the results of the study suggest that a dashboard that provides information that is limited in scope is easier to navigate. Future studies are also necessary to evaluate the influence 'attributes of engagement' as defined by O'Brien and Toms (2008) have on dashboard 'usability' (the amount of time and mouse-clicks necessary to complete each task across dashboard treatment).

Other questions to consider are: as electricity consumption feedback (ECF) becomes a more widespread tool to communicate and educate users about how to reduce their consumption, what steps can be taken to ensure that the software tools are designed in the most intuitive and straightforward manner possible? How can the design of the hardware and its supporting space facilitate positive user interactions with the dashboards?

APPENDIX A: DESCRIPTIVE STATISTICS

Descriptive Statistics – Lucid (Total Mouse Clicks)

	N	Min	Max	Mean	Std. Deviation
Q1Total	8	3.0	77.0	33.250	21.5125
Q2Total	8	1.0	44.0	22.250	17.1610
Q3Total	8	3.0	45.0	20.750	15.6548
Q4Total	8	1.0	94.0	19.875	31.3753
Q5Total	8	2.0	64.0	11.500	21.3006
Q6Total	8	4.0	30.0	17.000	8.9283
Q7Total	8	6.0	88.0	40.375	26.0655
Q8	8	.0	6.0	2.875	2.2952
Q9	8	1.0	20.0	10.250	5.6758
Valid N (listwise)	8				

Table 11 – Descriptive Statistics- Lucid (Total Mouse Clicks), TQ1-Q9

Descriptive Statistics – Alerton (Total Mouse Clicks)

	N	Min	Max	Mean	Std. Deviation
Q1Total	8	1.0	13.0	6.875	4.8532
Q2Total	8	.0	24.0	6.750	7.9776
Q3Total	8	3.0	50.0	15.250	15.1162
Q4Total	8	1.0	5.0	1.750	1.3887
Q5Total	8	5.0	14.0	9.500	3.7417
Q6Total	8	2.0	30.0	12.375	9.4859
Q7Total	8	3.0	68.0	21.000	20.3821
Q8	8	.0	5.0	1.625	1.8468
Q9	8	.0	14.0	3.375	5.0692
Valid N (listwise)	8				

Table 12 – Descriptive Statistics- Alerton (Total Mouse Clicks), TQ1-Q9

Descriptive Statistics - Lucid (Time)

	N	Min	Max	Mean	Std. Deviation
Question1Time	8	.06	5.86	2.9163	1.84487
Question2Time	8	1.12	3.04	1.8050	.59871
Question3Time	8	1.06	7.22	3.6038	1.85882
Question4Time	8	.20	5.78	2.0200	1.91672
Question5Time	8	.90	7.31	2.3137	2.17063
Question6Time	8	1.08	5.22	1.9688	1.37818
Question7Time	8	1.01	10.06	5.4288	3.23003
Question8Time	8	.23	5.01	1.4000	1.52842
Question9Time	8	.66	4.08	1.6313	1.20603
Valid N (listwise)	8				

Table 13 – Descriptive Statistics- Lucid (Time), TQ1-Q9

Descriptive Statistics – Alerton (Time)

	N	Min	Max	Mean	Std. Deviation
Question1Time	8	.39	3.02	1.5950	.82720
Question2Time	8	.30	2.02	.9075	.51727
Question3Time	8	.97	6.00	2.5738	1.72184
Question4Time	8	.26	1.12	.5050	.29938
Question5Time	8	.46	2.50	1.6625	.67743
Question6Time	8	1.04	6.26	2.9100	1.65624
Question7Time	8	1.12	2.95	1.8338	.72226
Question8Time	8	.12	2.75	1.2150	.78214
Question9Time	8	.31	12.52	3.2988	4.00346
Valid N (listwise)	8				

Table 14 – Descriptive Statistics- Alerton (Time), TQ1-Q9

Outcome Measure VI – Ability to Build Upon ‘Sustainable Knowledge’

Participant #	Task Analysis Responses	Correct/	Post-Test Interview Responses	Correct/	Point
Treatment	<i>9. In the space below, identify one way this website would help you conserve energy:</i>	Incorrect	<i>(Item #) Identify one energy-conservation tip provided by this website:</i>	Incorrect	
L 1	<i>Finding ideas from commit to conserve and implementing them</i>	✓	<i>Use a desk lamp instead of an overhead lamp</i>	✓	+2
L 2	<i>Go to the sustainability tab to see energy conservation actions on campus and how I can get involved.</i>	✓	<i>Using a water bottle ('because this picture has a water bottle')</i>	✗	+1
L 3	<i>By giving me info about various DIY things you could do to save electricity/energy at home</i>	✓	<i>Biking ('because that's what I do')</i>	✗	+1
L 4	<i>I think the best way is the competition. If students see their building and are proud they will compete and keep their lights off when they aren't using them etc.. Making a campus wide game out of it.</i>	✓	<i>Use desk lamp instead of overhead light</i>	✓	+2
L 5	<i>It gives me a list of energy saving tips and activities that I can choose to commit to over Facebook.</i>	✓	<i>Take stairs instead of elevator</i>	✓	+2
L 6	<i>Makes you aware by providing specific ways to reduce that can be found on the page.</i>	✓	<i>Use desk lamp instead of an overhead light</i>	✓	+2
L 7	<i>Makes me more aware of what I am consuming in my building.</i>	✓	<i>Use desk lamp instead of overhead</i>	✓	+2
L 8	<i>Use a desk lamp instead of an overhead light.</i>	✓	<i>Use desk lamps instead of overhead lamps</i>	✓	+2

A 9	<i>Use less water and electricity, see what needs to be conserved more with the graphs.</i>	✓	<i>Didn't really see the ticker across the bottom, until end of this questionnaire, but keep thermostat low.</i>	✓	+2
A 10	<i>Increasing awareness of all the types of energy use and possibly attempting to engender an understanding of how this relates to daily activity.</i>	✓	<i>Don't place lamps near air conditioning or TV</i>	✓	+2
A 11	<i>It is probably to improve on the aesthetics of it. Probably the recommendation I would give would be maybe improve a little on the right hand side it seems really dark and I can't really see it as well.</i>	✗	<i>Daylight harvesting (not an energy conservation tip)</i>	✗	+0
A 12	<i>Would be to know what the cost of each technology is - and by knowing changing my behavior to reduce cost.</i>	✓	<i>Didn't find any.</i>	✗	+1
A 13	<i>Tips scrolling along the bottom of the screen</i>	✓	<i>Turn off home office equipment when not in use</i>	✓	+1
A 14	<i>Remind me to be conscious of energy consumption</i>	✗	<i>Reflective roofing = less hot building</i>	✗	+0
A 15	<i>By seeing where the most energy is being used and why, therefore encouraging people to make adjustments.</i>	✓	<i>I didn't see any tips</i>	✗	+1
A 16	<i>To influence environmental decisions on sustainability by providing real time access to building performance data</i>	✓	<i>To turn off office equipment when not in use</i>	✓	+2
Participant #	Post-Test Interview Responses	Correct/	Post-Test Interview Responses	Correct/	Point
Treatment	<i>I understood the purpose of this website. Explain.</i>	Incorrect	<i>(Item #) In the space below,</i>	Incorrect	

			<i>please describe what you believe the mission of this website is.</i>		
L 1	<i>It presents a lot of statistics on energy consumption of Cornell.</i>	✗	<i>To give information on energy consumption of different campus buildings and to promote energy saving.</i>	✓	+1
L 2	<i>'The mission is on the first page and then I saw the commit to conserve in the measurements of our energy usage every day and campus sustainability. I think it is very clear what the purposes of the functions seem to align with the purpose of the mission.'</i>	✓	<i>"Provides real time utility data in an effort to reduce our consumption and carbon footprint and also fosters awareness of campus 'green' initiatives"</i>	✓	+2
L 2	<i>It presents a lot of statistics on energy consumption of Cornell.</i>	✗	<i>To give information on energy consumption of different campus buildings and to promote energy saving.</i>	✓	+1
L 3	<i>I understood that this tool was to provide info to anyone on how much energy we are using</i>	✗	<i>To demonstrate Cornell's leadership in env. Stewardship and sustainability by providing real-time data to reduce our consumption.</i>	✓	+1
L 4	<i>Making Cornell sustainable -having a means for measuring & educating & motivating.</i>	✓	<i>Educate and motivate students and Cornell as a whole in sustainability with regards to electricity, heating and cooling.</i>	✓	+2

L 5	<i>Learning about energy consumption and learning how to save energy on campus.</i>	✓	<i>It gives me a list of energy saving tips and activities that I can choose to commit to over Facebook.</i>	✗	+1
L 6	<i>I understood the purpose from my point of view, not necessarily for [the same reasons] why it was created</i>	✗	<i>To provide data on energy usage and conservation and sustainability</i>	✗	+0
L 7	<i>It was interesting to see where the buildings lined up. And how one goes to the other but it is just a little weird because each building has different purposes so you kind of account for that already.</i>	✓	<i>The website is designed to inform the user of Cornell's actions towards being more 'energy' conservative.</i>	✓	+2
L 8	<i>This website is for anyone who wants to find out their energy use and how to improve it.</i>	✓	<i>To provide easy and relatable access to information related to electricity use for the Cornell community. The use of this website is giving comparative information to those looking for areas of improvement.</i>	✓	+2
A 9	<i>I did understand that they wanted to showcase the information and for how much cooling, for water and for the heating system, and overall energy usage in each building is, and kind of show where the problem areas are. It seems like the purpose would have been better if it was more channeled to what you can do to help. But if someone was just</i>	✗	<i>Showcase the energy consumption data.</i>	✗	+0

	<i>interested in it, I feel like the website would make sense.</i>				
A 10	<i>The first page told me the purpose.</i>	✗	<i>Increase awareness and understanding regarding energy consumption as well as various ways it is consumed.</i>	✓	+1
A 11	<i>Questions made it easier to understand purpose of website.</i>	✗	-	✗	+0
A 12	<i>It was easy to tell that HEB wanted to tell us about energy expenditures and the effects of new technologies.</i>	✓	<i>To make getting knowledge about energy savings easy and to have that knowledge influence change.</i>	✓	+2
A 13	<i>The purpose of the website was clearly stated on the homepage.</i>	✗	<i>Make public information about daily energy use. Increase understanding of energy in order to shape behavior and decision-making. To help assess building performance.</i>	✓	+1
A 14	<i>Remind me to be conscious of energy consumption</i>	✗	<i>To help students understand and access sustainability info.</i>	✓	+1
A 15	<i>Its clear that the website shows how energy efficientness of the building.</i>	✗	<i>To describe how energy efficient this building is</i>	✗	+0

A 16	<i>I agree, the mission, or system goal on the homepage was clear.</i>	✗	<i>To influence environmental decisions on sustainability by providing real time access to building performance data</i>	✓	+1
Participant #	Post-Test Interview Responses	Correct/			Point
Treatment	<i>I would use this website on a routine basis. (1=strongly agree; 5=strongly disagree)</i>	Incorrect			
L 1	<i>4= once a semester</i>	✓			+1
L 2	<i>2= once a month</i>	✓			+1
L 3	<i>2= once a month</i>	✓			+1
L 4	<i>3= several times a semester</i>	✓			+1
L 5	<i>3= several times a semester</i>	✓			+1
L 6	<i>4= once a semester</i>	✓			+1
L 7	<i>5= never</i>	✗			+0
L 8	<i>4= once a semester</i>	✓			+1
A 9	<i>4= once a semester</i>	✓			+1
A 10	<i>4= once a semester</i>	✓			+1
A 11	<i>3= several times a semester</i>	✓			+1
A 12	<i>2= once a month</i>	✓			+1
A 13	<i>2= once a month</i>	✓			+1
A 14	<i>4= once a semester</i>	✓			+1
A 15	<i>5= never</i>	✗			+0
A 16	<i>5= never</i>	✗			+0

Table 15 – Outcome Measure VI – Ability to build upon ‘sustainable knowledge’

APPENDIX B: PARTICIPANT DEMOGRAPHICS

Participant Demographics Pre-Test Questionnaire Results

Participant	Q1 Previous Experience*	Q2 Classification*	Q3 Major*	Q4 Design Background*	Q5 Programming Background*
LD1	5	junior	Applied Economics & Management	DEA 1500	No
LD2	5	sophomore	Economics	Intro to Web Design	Intro to Java & Intro to Web Design (HTML, CSS, PHP)
LD3	3	junior	Natural resources	No	No
LD4	5	senior	Engineering	No	Yes. Programming
LD5	5	sophomore	Ecology & Evolutionary Biology	No	No
LD6	5	junior	Biometry & Statistics/ Nutritional Sciences	No	Yes. Python & code in R
LD7	5	graduate student	Apparel Design	No	No
LD8	5	junior	Agricultural Science	No	No
AD1	4	freshman	Engineering	High School Yearbook	Matlab w/ Little Prior Experience
AD2	5	graduate student	Human Development	No	Familiar w/ SPSS Syntax.
AD3	5	junior	Food Science	High School Art	Nope
AD4	4	senior	Nutrition	No	No
AD5	2	sophomore	Science of Natural & Env. Systems	No	A little bit of Java
AD6	4	sophomore	ILR	High School Art	No
AD7	5	senior	Hotel	Hotel Design Course	No
AD8	5	junior	Developmental Sociology	No	No

Table 16 – Participant Demographics (*Refer to Pre Test Questionnaire Items Below)
Pre Test Questionnaire Items

PreTest Q1.

Do you have any previous experience with an energy dashboard?

1. very familiar
2. use 2 or more times
3. used 1 time
4. heard of this but never used one before
5. not a clue

PreTest Q2.

Please state your classification.

1. freshman
2. sophomore
3. junior
4. senior
5. graduate student

PreTest Q3.

Please state your major.

PreTest Q4.

Do you have any design background? Please describe any design experience you have below.

PreTest Q5.

Do you have any computer programming background? Please describe below.

APPENDIX C: LUCID DASHBOARD TRANSCRIPTIONS

Participant: LD01

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

LD01: Okay, so I am in the building dashboard homepage. My first thought is I like the pictures of the different buildings I think it's really aesthetically pleasing right now. So let's see, the tabs are pretty clearly laid out. It might be more helpful if they were higher because I'm first drawn to the pictures because like I said they're nice, but they're not really helping me solve what I need to I think right now. So I'm on question 1 right now...

LD01: So I think I'll scroll down a little bit, Okay. I see on the right here "building comparison" and I am in the "Human Ecology Building." I see Human Ecology Building, 197 kW, I'm not seeing the time here. So I guess that's just the amount that I've used today, or that Human Ecology has used today. I'll scroll back up, maybe it's under comparisons tab. Okay, so this is a lot of information I think, again I'll look for Human Ecology under academic building. That's neat that it breaks it up like this. That makes sense to kind of narrow it down. Again I'm looking for Human Ecology. So far today... Okay. there are quite a lot of settings to change, it's a lot of information. I'm not sure how these buildings are organized, maybe if they were alphabetical in each category. I'm going to "all buildings" because I didn't see Human Ecology there. Oh, here it is. Okay so I'm going to add it to a graph. And looks like the highest for today was at 10 o'clock am, so I'll write that down.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
-----------	-------------	-----------

Transcription:

LD01: So now I will move on to question 2.

LD01: Um, so I saw somewhere an option for "custom period." So I guess I'll choose yesterday, the 21st, to today. I'll change the hours to keep it consistent. I felt that was easy to navigate. Let's see, I'm not sure if I'm still selected as Human Ecology. Yes, okay. Let's see. I'm not sure if, well yesterday at this time it was 203.1 and today it is... Okay. I'm having trouble clicking, navigating this, 211.2 so it looks like it's increased since yesterday.

LD01: Maybe if there's a bar graph feature somewhere in here (line graph currently), maybe it's because I picked a short period that it's not what I think, that would be helpful in seeing the differences, this is kind of skipping around when I try to navigate it (cursor on line graph).

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

LD01: So moving on to question 3...

LD01: Um, I don't see anything financial on this page, so I think maybe "sustainability." Okay, this does not look like what I'm looking for although I like the picture, I think it's really bright and eye catching, and I like the choice on the side to look and read about our sustainability initiatives. Go back to "comparison" maybe. I'll go back to the homepage because I'm not sure where this, where I can find this equivalent. There's a lot of information on this first page, and I think maybe keeping the fonts more consistent, there's the different colors here and a lot going on to follow. So I'm looking, still looking for the demand equivalent. Okay, now I see what this commitment thing is, I don't think that will help me although that's interesting. Maybe that should be moved down (commit to conserve). I don't see a reason why someone would visit this although I guess on the homepage it is a good place to draw attention, but it didn't really make sense to me what that was at first. Okay. I also think this mission should stand out a little bit more (text imbedded in homepage section), just with this grey and white writing, I didn't notice at first that that was the mission, like the whole point of the cite. Maybe other visitors would have a better idea of what they're looking for, just as a first time visitor, I didn't notice it, and I think that should be the most eye-catching thing on this cite. Maybe like above the pictures and with more contrast in the background, and the lettering.

LD01: Okay, so I'm still looking for "cooling." I'm going to see what the facility services is (clicks on link). Okay. That doesn't look like what I want (clicks on comparisons). This is back to kWh. I don't think it would be under "competition" but I'll look here. Okay, I like that it ranks the dorms against each other, I think that's a neat feature. I'm going to pause...

LD01: Okay, so I just noticed in re-reading the instructions that this is specifically for the Human Ecology Building. So I will click that. Oops. I accidentally clicked Comstock (top section of buildings). So I'm going to go back. Not really sure how to navigate back. Oh. Shoot, I think I just exited. I'm sorry I tried to go back... oh, okay. So I'm back to the homepage and now I see that I need to look specifically for the Human Ecology Building. So I'm scrolling over to... okay, so this should bring me specifically to what I want to see by this

building. Okay I see the numbers changing on the side here, our peak use today was at 10 o'clock am. Okay, number 3, demand for cooling, chilled water. Okay that came up pretty quickly (bar graphs). I do see the dollar equivalent on here, so it's been \$10.89 so far today.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

LD01: If I want to see by "month," I see that there's the setting here to change by month. I think this looks very good aesthetically, I think it's easy to follow, I like the dollars and the different ways you can view the usage on the side. Oh, which month of the year, okay, moving on to question 4. I see, click on "year" here. It looks like it just started measuring in March, unless I'm clicking something wrong, so March is more than April. And I think I'm not supposed to be on dollars anymore. But still this is the most.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

LD01: Moving on to question 5...

LD01: I see that "heating" is also an option. I'll click on "month." I like that this is in red (bars). It distinguishes itself here. And it looks like heating was highest on, slightly higher on April 3rd, so the highest on April 3rd.

LD01: Okay so now that I overcame that initial struggle of finding everything within Human Ecology, this has been very easy to navigate and read. I like that it changes on the side, although it's, as you drag it, it changes. That instant response is neat. I like that.

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

LD01: Moving on to question 6...

LD01: Okay, so I had already explored "comparisons" a little bit earlier, so I'll go back to that page. Again I like how the buildings are broken up. Okay so it looks like the highest consuming dormitory was Carl Becker house. Okay, I see that it's ordered in use of consumption. I think that maybe ordering alphabetically would be more helpful, although there are only a few in this case. Okay, I see total, and then "per person," okay yes. So Carl Becker is still the highest with 1,175 kW.

7. Lake source cooling represents the following % reduction in energy use for campus cooling. _ %

Transcription:

LD01: Okay moving on to question 7...

LD01: Okay, so maybe under, okay no not that. Um, “sustainability,” no I think I already visited this. I’m going to go back to the homepage because I remember something about reductions. Okay, lake source cooling. Okay, I’ll go back to “cooling,” I’m not really sure where to find a specific percentage of reduction of energy use. I see okay, campus conservation, um I like the budget here on the homepage, I’m just noticing, measuring where we are. Oh, maybe it’s under, I didn’t see that you could scroll down here. (Participant is looking at the ‘commit to conserve’ section). Okay, these are all still, commitments.

LD01: Okay, I’m still looking for information about lake source cooling. I’m going back to check “comparisons.” I’m not sure... this is energy use for campus cooling. I’m still on Human Ecology. I think I’ll go back to the homepage. Okay I’m still looking for this, I just wish that there was a search bar somewhere, I see “find buildings,” but maybe if I could just search “lake source cooling” that would be helpful. Okay, I’d like to skip question 7.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

LD01: Moving on to question 8...

LD01: I think the mission is right here on the homepage. That makes sense. Okay, so I would say that the mission is the second paragraph here (points to text) “the dashboard provides real-time utility data.” That makes sense. Maybe if the mission was clearly marked, in bold or something, that would be helpful, it’s not really distinguished. That seems to be the mission, so I’m going to write it down.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

LD01: Moving on to question 9...

LD01: I see that the commit to conserve definitely gives good ideas for conserving energy, so I think that’s important, and I also think the idea of committing to it, or clicking commit, so lots of easy, good ideas here. I think easy is the key. They’re definitely feasible and not inconvenient, so I could conserve energy by taking the stairs instead of the elevator. But to answer the question, I would just look at “commit to conserve” ideas, and commit to several of them.

END OF TASK ANALYSIS

Participant: LD01
Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

LD01: I would strongly agree with that. I like the bright colors and on the front page I like the pictures. I like how they have a picture of the buildings. I like the Cornell stuff on the side. I really like the color scheme.

2. The layout of the website is well organized.

LD01: I would agree, I think that it could be improved a little bit more. Maybe if there were more main tabs here I mean on the homepage. Maybe like tabs within each tab and instead of just the boxes. It seems like a lot there's a lot going on here so I would say I agree but it could be improved slightly.

3. This website has appropriate use of color.

LD01: I would say it has appropriate use of color. I would say that the color over all is good. Maybe in the mission here it could be a little brighter or something distinguishing but overall I like the orange that differentiates. The pages on the website are consistent. When I flipped between them in comparison I thought that everything was color-coded pretty well the red for hot and the blue for cooling the colors and the pictures are bright and exciting so I would agree with the appropriate use of color.

4. The pages on the website are visually consistent.

LD01: The pages on the website are visually consistent and when I flip from page to page they had a similar layout. I think overall they do, like once I found my way into a graph or something I thought it was easy to change the settings, overall I was a bit confused but maybe it was just because it's a lot of information for my first time. It made sense once within each measurement or comparison. It made sense once I was able to get there and make changes switching dollars and kilowatts per hour but overall when I was going through it, I was scrolling through, I was a little bit confused.

5. In general, it's a good balance between graphical and textual information.

LD01: I would agree the visual comparisons are really, very helpful. I know that blocks of text people are really less likely to read. So I think especially in this context of measuring different amounts of energy usage and trying to compare

them I think there is a good amount of visual information so I would strongly agree with that.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

LD01: Kind of like I mentioned earlier I wasn't always looking in the same place I didn't feel like everything was always in the same place. Maybe if there was some kind of search function where I could find a keyword that I was looking for or something I didn't look in other buildings but I think that would be consistent. I mean, I only I like that if you're looking for a certain building the same graphs come up and once I did that for Human Ecology. I would be able to do that again for the other buildings so it is very consistent in that matter I would say neutral and I would say that it could be improved by adding a search function for things that are maybe impossible to make consistent and then again maybe just changing the tabs would make that easier.

7. Remembering where I am on this website is easy.

LD01: Remembering on the website is easy. I think, I think that was pretty easy when you're looking by a building I mean the homepage is always there I think it's easy to go back to it yet I think I mean you can still see everything even when you look for a very specific building when I just click. I like that the button is red and it kind of distinguishes that it would bring me back to the homepage but I would agree with that.

8. The organization of the menu on each page is quite logical.

LD01: As I mentioned the homepage does not really seem that way. The commit to conserve in the building comparison, the Twitter, I don't know think some things get kind of random once you get into a certain building's menu and then it's almost like you're back to the homepage but it's kind of confusing because you're not.

9. Few mouse clicks are needed to find a given piece of information on this site.

LD01: I would slightly disagree on that a few mouse clicks are needed to get a piece of information. Once you've navigated for the first time in terms of measurements of what you're trying to look for then fewer clicks are needed.

10. I am engaged when using the website.

LD01: I'm engaged because like I said it is very aesthetically pleasing. I think I would be more engaged the more I use it. Obviously the more familiar you become with that you can navigate through different buildings and if I had a purpose

like looking for a certain buildings information or if I'm living in a residence hall and I'm into the Cornell Conserve competition I would be more engaged.

III. Content

11. I understood the purpose of this website.

LD01: Strongly agree since the mission is on the first page and then I saw the commit to conserve in the measurements of our energy usage every day and campus sustainability. I think it is very clear what the purposes of the functions seem to align with the purpose of the mission

12. The information I found meets my needs.

LD01: I would say yes, the measurements of energy they have such as electricity, heating and cooling you can see in different ways and then different increments. I think it is very easy to manipulate the data to get exactly what you want.

13. I felt information presented by this website is meant for a more technical audience.

LD01: I would slightly agree with that and I think it's pretty user-friendly but like kilowatt hours and some of this might be a little bit more technical. Although I would say it helps to compare even though if you don't know what you're using, you know it's going up and down. I would agree with that although it has parts that are relevant to anyone that's intending to conserve also the scavenger hunt question that I got caught up on I didn't know what lake source cooling was talking about. Maybe if it compared between universities that would give more of a background

14. I find it was difficult to relate to the energy units presented.

LD01: I would agree but they do have dollars in CO₂ and that makes more sense to me and also benchmarking over different dates.

IV. Usefulness

15. I found this website useful.

LD01: I would agree it has ways to reduce your emissions and see what other universities are doing.

16. I would use this website on a routine basis.

LD01: I don't think I would use of that frequently unless I had some project or purpose or assignment that have to do with this or if maybe there was a competition in my dorm and I was really into it maybe like once a semester.

17. Identify one energy-conservation tip provided by this website:

LD01: I liked the commit to conserve tip to use a lamp instead of an overhead light.

18. Please identify the feature of this website you found most useful:

LD01: Probably commit to conserve because it seems to affect me on a personal level as opposed to any building in which I can't change much.

19. Please identify the feature of this website you found least useful:

LD01: I mean on this page it's the weather underground thing because it doesn't work.

END OF POST TEST INTERVIEW

Participant: LD02

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

LD02: So I am going to look where I can find the information on this website. I see the different locations. Oh, maybe the “comparison” tab will help me find that. Um, so I see that it says the number of kWh from January 22 to April 22, so I am trying to find April 22, which is today. And there is a lot of stuff going on in this website, so it is a little hard to navigate around and find the information I’m looking for. And it’s giving me a lot of information for the different energy consumption for the different houses, but I’m trying to figure out how I can pinpoint today because that’s what the question is asking for. At what time, highest so far, and also the time. It is giving me the information in terms of location. But oh okay, I found it! There’s a little tab that says today next to last 12 months, but it might help if this tab were a little bigger so it’s easier for people to find. And lets see. Now it’s giving me the information from 12am to 12:33pm. I am going to put the graph in... it already is in “descending” order, but I am going to look in terms of “all buildings electricity” and it says Duffield Hall? Wait no, at what time was electricity highest so far, at what time. Let’s see if I can list it by time, not location. “Custom period,” maybe that will... “start time,” no that’s only giving me the ability to adjust, but “average hourly rate” “total” “per square foot” “all building” “heating” I don’t really want to look in terms of location. So, I will keep looking to see if there are any other options down here and hmmm. Comparison... today, I am going to give up I guess for this one.

2. Today’s electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

LD02: Okay, question 2.

LD02: Um, okay I will still use the “comparisons” table and I see “today” and I guess I will go to “last 12 months” April. It’s giving me a very general time period, saying from January 22 to April 22, so I don’t know how to pinpoint tomorrow. Oh, okay I can drag this tab to highlight the blue part to change the time, ooohh, I see how you can find the highest energy consumption. Time as of today, but since I can’t go back to question 1. I guess I can’t go back and answer it, but the blue tabs function is a little confusing because again it is a little small and the label “time” is also pretty small, so I would just maybe put

a label next to the blue tab, so people can know you can slide it to each time of the day.

LD02: And so, back to question 2. I need to see if today's energy consumption has increased, not changed, or decreased compared to yesterday. So let's see if I can do something in "custom period." Okay, yes I can do that, so I will change the start date to April 21st, that was yesterday starting from 12am. To yesterday April 21st, 12pm. "Go." And yesterday, I guess I will just look at some of the statistics, Duffield was also the highest energy consuming yesterday and it consumed 9,022 kW. And let's see "today." Today is 9,730 kW, and looking at other buildings, it's about the same trend, so today's electricity consumption has increased compared to yesterday.

LD02: And maybe it would also help, maybe I'm just not looking, not finding it. It would also help to have an average statistic, for example like the total average energy consumption, so that I don't have to look through all of the different buildings to compare.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

LD02: Moving on to question 3...

LD02: So I will look at the tab "all buildings cooling." So, I guess I will have to change the unit somehow. Um... it's telling me the energy consumption for kBTUs, that's the unit that they're using right now, but I'm not so sure how to convert that into dollars. Maybe I will look somewhere else, say try the homepage tab. Maybe it will give me some information on that. There is a lot of stuff going on in the homepage also. There are pictures, and a lot of different sections of the page with a lot of words, so maybe there is a little bit more space in between them. And you can put all of the information on different pages to help the viewers see each individual section more clearly. I will try the "competition" tab. And it's loading, oh, it's telling me again in terms of location, where on campus saved more energy. Let's try the "sustainability" tab and it's just a photo gallery, I guess the tabs might be better labeled. For example, the "sustainability" tab, I'm not sure what's in the tab just by looking at the title, so if it's going to be a photo gallery, it can be labeled as so.

LD02: I guess go back to the "comparison" page, and keep looking in the graph labeled "all buildings cooling." And "total" "per person" "per square foot" "accumulation" "average hourly rate" "descending" "ascending" "alphabetical." Hmm, I am not so sure if I can find it. So I guess I will move on to the next question.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

LD02: So I will looking the “last 12 months.” And will use the slide, the blue slide to pinpoint which month. So, if it’s “demand for cooling” I would assume that it’s mostly going to be in the summer so I will start from August. Hmm, it’s telling me zero for the buildings. “All building cooling” hmm, that is very weird. Maybe I’m not looking at the right statistics, “accumulation” “average hourly rate,” that still shows zero, “accumulation,” I’m going to try to put it in “ascending” order, that didn’t do anything, go back to “descending” order. Umm, August, I will try different months. July, um that’s still giving me zero for all of the buildings. I am not sure why is that. I think that should be where I’m looking at. Comparison “today” “custom period,” July, well then again for someone who’s not familiar with all of the scientific terms, say like kBTUs, I’m not so sure what that unit is. I am now starting to wonder if I am looking at the statistics in terms of the wrong unit because it is asking for chilled water in terms of tons. So maybe it would be helpful for people who are not so familiar with the scientific discipline to have some information about the units, some explanations about conversion. I think I should be looking at the “comparison.” The search tab says “find building” so I guess that’s not a place where I can just put a key word and search for it. Um, so let’s try, oh if I move the blue tab to more current ones, is that going to help? Yes, so if I pinpoint down on April, it is giving me the information, but let’s see how far I can go back in time to get some statistics. Say if I try November of 2012, it’s giving me zeros for all of them. And if I do December 2012, it’s also giving me zero. If I do January 2013, it’s giving me zero. I’m going to slide the tab to February 2013, that’s also giving me zero. That makes sense because we really don’t need cooling in the winter. But March, from March 1st to April 1st, so in March, that’s where we first have “demand for cooling” and that is a big number, I’m not going to attempt to say that number out loud, but let’s compare that to April. Um, it seems like April has higher demand for cooling so, that’s what I am going to say.

LD02: So if we’re trying to compare across year it might be more helpful to have statistics on all of the months, instead of the most current one I’m thinking.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

LD02: Okay, I’m going to move on to question 5...

LD02: So I think I’m getting more familiar with this website as I’m doing this. So I’ll go to today, actually last 12 months. Custom period... which day of the month, oh, yes, I will pinpoint down April, from April 1st 12am to so far this month, today go. Custom period. It might be helpful if, you know in the last 12 months

I am able to select the different months, and today I am able to select different times of the day, but if there is something that will allow me to select the different times of the month, that will be really helpful.

LD02: Well, I will go to “all buildings heating” first. Let’s see if I can do something under the “total,” no I won’t be able to change... “average hourly rate” and order of appearances and help me, so I guess I will.. which day of the month.. Oh dear. I will have to do custom period for every single day I guess. All right, so I will start with April 1st. I will change the time from April 1st to April 2nd, this is just a very minor thing, so for the selection of the time of the day, maybe it also helps to have a drop down menu for me to select the time of day instead of having to keep clicking to increase or decrease the number. So I’ll do 12am on April 2nd. Go. And that is giving me, let’s see, this statistics, hmm, will I have to add all of these numbers to see, that would be a little troublesome, so I guess I will just write down the number for the highest...

I01: The questions are just for the Human Ecology Building...

LD02: Oh, I see... okay, oh, I’m sorry. Okay, I will, that makes a big difference. I guess I will search Human Ecology in the search bar. And let’s see, I’ll also go to consumption (comparison) tab, it’s loading, and I can see the statistics on top with the graph, I like the interface of being able to move my point along the graph for different times of day, it’s fun and interactive. The little image that’s telling you how much energy consumption is so far today, is also pretty helpful. And down there in the homepage, comparisons, competition tab, it’s still showing other locations. So maybe that is for the purpose of comparison, but anyway I will go to question 5 and look at the statistics by month. There we go, okay, so in the month part the top axis is labeled “3, 5, 7, 9, 10.” I’m not so sure what these numbers represent. I’m guessing these are the dates, let’s see if I can get a clue, yes, when I’m looking at the “week” tab, the top axis is telling me which day of the week. I’m assuming it’s telling me which day of the month in the “month” tab. I’m going to go to the highest bar that’s saying 1, so I’m guessing April 1st is energy consumption highest day. I guess you can infer the purpose of the top axis from other tabs and also how many information is presented, but it would probably be more helpful to label the axis just in case. Actually, never mind that was April 2nd. It doesn’t have enough space to put in all of the date numbers that’s why some of the dates are listed, maybe if you can move around the layout a bit to expand the graph, and make the numbers a little more easily readable and have more room for specific data.

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

LD02: Okay moving on to question 6...

LD02: Okay in this case, it's helpful that the statistics are right down below. So I will go to "last 12 months," which is showing me from January 1st, so I will actually go to "custom period" to select January 1st and to April 1st, and I will change that. January 1st 12am and April 1st, actually I will change it to 12pm. And "last 12 months" "custom period" "go." And the highest energy consumption is Carl Becker house. And I will list it by "per person" and that is 1,776 kWh/person.

7. Lake source cooling represents the following % reduction in energy use for campus cooling. _ %

Transcription:

LD02: So moving on to question 7...

LD02: So I guess that is a different type of cooling. I will go to the "cooling" tab on the top, and lake source cooling. It's only listing "chilled water use." I am not so sure what lake source cooling means, but I will just go ahead and answer it anyways. It says percentage reduction in energy use, this page doesn't seem like it's giving me information on percentage reduction. So I will try another tab, say "competition," I remember it has information about reduction. I am not sure if this question is referring to specific buildings, or energy reduction for campus cooling. I guess campus cooling means an overall measure. Doesn't look like there's more down the page anyways. Lake source cooling hmm, I don't think I can, let's see if homepage gives me anything. I am reading this blurb on the top, it's telling me not the information I need, so I'll close this message window for now because that might be distracting. And there's discussion and budget on the homepage, it's a lot of information to digest. So I guess I will still go back to "competition" to see if I can find any more stuff on the page. Don't know if I can find anything for lake source cooling, so I guess I will go to the next question.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

LD02: Number 8...

LD02: I think this website is to provide energy consumption information for Cornell University campus, and also to promote how we can more effectively save energy. I'm just going to write that down... to give information on energy consumption of different campus buildings and to promote energy saving.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

LD02: Moving to question 9...

LD02: Let's see I will go to the "sustainability" page to see. Since the photos look like either they were promoting energy saving, or maybe it will help me, there will be photos to show me how I can conserve energy. It's giving me photos about buildings on campus and people on campus related to energy conservation. There we go. This photo shows ("take back the tap") water conservation by using the water bottle. And energy conservation initiatives, this picture is not that helpful in telling me what the initiatives are. "Green building at Cornell, energy efficient laboratory, CU recycling and solid waste," recycling I guess that's another way I can conserve energy, and "tech campus" and "greening the fleet" environmentally friendly cars. I guess one way this website can help me conserve energy is go to the "sustainability" tab to see examples of energy conservation and if these ways to conserve energy are applicable to me, I can certainly do more of these things to conserve energy. Go to the "sustainability" tab to see energy conservation actions on campus and how I can get involved.

LD02: Some ending remarks about the website, on the top of the website, on the background there is a picture of Cornell University clock tower, but the rest of the page, since the picture is cut off in the middle, is grey. I think because the statistics and main content of the website is already pretty busy, putting a picture in the background might just be an extra burden on the eye because the picture has a lot going on there also. But if you are going to put a picture try to put it so that it covers the whole page, so there's a nice consistency, not just the top part. It looks like it's gonna be a banner, but not really since it's behind the body. But I would say a solid color, or pretty simple pattern would work better than a full blown picture. And I like the color scheme of the website. Sometimes... for example, in the competition tab the green and red of the website is a little conflicting but that is not that bothering. But I think for the layout it would help to put more space between different content of the body and more labeling for people who are not so familiar with the statistics and research, and scientific terms. And also I could make the website to show up bigger, but it would also help if some of the fonts are bigger also.

END OF TASK ANALYSIS

Participant: LD02
Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The Pages on this website are visually attractive

LD02: I would say I agree because I like the use of the interactive faces [/interfaces/], I think it's a nice way to get the user interested and I especially like the little graphics that tell you the energy consumption of buildings per day I think that adds fun to the statistics which can sometimes be a little dry to people who're just browsing the site. The graphic uses are really interesting. I think I like the little icons on the different tabs. Again, those are just static points that make this site more interesting and fun and visually attractive.

2. The layout of this website is well-organized

LD02: I would say I disagree because I did have some trouble looking through stuff. While it was also partly my fault for not reading the question, sometimes the page tended to get very crammed and hard to look for information because there's a lot of stuff going on and as I said before it would be better to break up a lot of information on the page into different sections.

3. This website has appropriate use of color

LD02: I think so I picked neutral on this one, I like the red of course representing Cornell and the green representing energy conservation. For example, heating and cooling have different colors representing their graph bars; cooling has blue and heating has red, electricity has a neutral orange-ish color but for a lot of information once again a lot of colors could be overwhelming to the eye. But overall the meaning of the color is really appropriate. So maybe if the layout could be improved the use of different colors would be more okay for people to look at.

4. The pages on this website are visually consistent (when I flip from page to page have a similar layout look and feel which helps me find answers more quickly)

LD02: I would say I agree because for example if I go into the comparison tab the comparisons between buildings are on the bottom and the things you can do with the statistics is the same even though I would choose not to use so many buildings statistics. It is pretty consistent. The only thing that is inconsistent is the homepage. It has a lot of different smaller sections.

5. In general this website has a good balance between graphical contextual information

LD02: I would say I disagree because this website has definitely from my experience more graphical information than textual information and sometimes I do think that for labeling of the graphical information more text would be needed for people who don't have a scientific background like me to be able to understand what the statistics mean.

II. Navigation

6. I found organization at various functions of the website where consistent across pages

LD02: I strongly agree because for the comparison I used mostly you can basically do the same thing all the time with days, weeks, and months. The only thing I can think of that could be improved would be to make the text bigger and to label the functions more clearly. For example, I wasn't so sure what to do with it first until I tried it out that I found that I could change the date from day to week to month.

7. Remembering where I am on this website is easy.

LD02: I'd say that I strongly agree because there aren't many tabs and I can clearly see which tab I am in.

8. The organization of the menus or information in each page seems quite logical

LD02: I agree because for example when I'm in the Human Ecology Building page it gives me the specific information about the Human Ecology Building and the menu options on electricity heating and cooling in the top section. When I select I can see clearly their purposes and I think also that down below where I can see the comparison page the buildings are listed in different tabs.

9. A few mouse clicks are needed to find a given piece of information on this site

LD02: I would say neutral because I think that that is something that website is trying to do so that people can minimize their number of mouse clicks when trying to find information. That is why a lot of information is on the page I'm guessing but sometimes more tabs would actually help people to help themselves to find the information they need in a few mouse clicks and would be more time-saving than trying to navigate through the page and sort through the information for what they're looking for.

10. I am engaged when using the website

LD02: I would agree because it's really fun and I guess the interactive part was what I really liked. I could customize the time I want and when I'm looking at the data. Other than that I think that was about all the interactive material I had but I think for this kind of website having too much interactive stuff would maybe confuse people who don't have a good scientific background.

III. Content

11. I understood the purpose of this website

LD02: I would strongly agree because it presents a lot of statistics on energy consumption of Cornell.

12. The information I found meets my needs

LD02: On the question on the scavenger hunt I would guess so but in terms of my personal needs outside of this test I would say neutral because I would appreciate if there was more specific information on how I could become involved in the energy conservation effort. Looking at other examples on campus would help but only if there is more concrete instruction more than just pictures.

13. I felt information presented on by this website is meant for a more technical audience

LD02: I agree because some units or technical terms can be better explained I wasn't familiar with the units on the comparison page.

14. I find it was difficult to relate to the energy units presented

LD02: I agree because some of the labels are explained for example in kilowatts but definitely for the comparison page they are presented in long units that I wasn't sure the meaning of.

IV. Usefulness

15. I found this website useful

LD02: I agree because it does give me a lot of statistics.

16. I would use this website on a routine basis

LD02: Maybe once a month just to see how the energy consumption is going. I'm not so sure that I would monitor it very often unless it would tell me how my action impacted the energy consumption of the whole campus. It is not giving

me so much relation between my personal actions and their impact on the campus.

17. Identify one energy conservation tip provided by this website

LD02: Refilling a used water bottle.

18. Please identify the feature of this website you found most the useful

LD02: I would say the sustainability page because in terms of my needs I want to figure out how I can conserve energy and the conservation page showed me examples of how I can do that and also how get involved the people I could contact, the organizations I could join on campus.

19. Please identify this feature of this website to you around the least helpful.

LD02: I guess of the competition part of the website because it's good to know how each building is doing in terms of energy consumption but it may be more useful if there was information on how the houses and different buildings did it instead of just telling you how eco-house had the greatest percentage of energy reduction. If there's more information on how to a house made those reductions maybe then people would know how to achieve the level of energy reduction eco house made.

END OF POST TEST INTERVIEW

Participant: LD03
Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

LD03: All right so the website looks very nice I think the background with the clock tower is slightly distracting but I like the fact that it has all the buildings on campus on the very first page so if I want to look at any of those I can kind of just look and compare, which is a good thing. It also has a comparisons tab, which is awesome.

LD03: For the Building let's see, it's pretty well laid out there's kind of a lot of stuff going on the first page, but that's fine. Electricity... (clicks around). So still looking for the Human Ecology Building. Can't see the yellow cursor thing. (Asks question). So let's see, so I can see the total consumption for all these pretty easily but it doesn't tell me the hourly consumption. Last 12 months, today... now I'm looking at the energy consumption for today, average hourly rate of consumption for all buildings. I'm looking at the Human Ecology Building. (on comparisons tab, all bldg. electricity). Still trying to find a way to look at the hourly consumption. All right, so now I'm moving on to the next question...

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

LD03: So now I'm gonna look for the comparison of today to yesterday. Let's say start day, so if I put in yesterday's start date, 12pm, I'm just going to do a comparison from April 21st 12am to April 22 12am even though it's not a complete day. Seems that today we have already used more electricity, and this was kind of hard to find 'cause it's kind of hard to find out if there's an easy way to find out energy consumption even though we have a comparisons tool. If there's a way to see right on the homepage how much we're consuming now compared to how much we consumed yesterday, or the day before. Just in terms of numbers, not even graphs, I think that would be really helpful.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

LD03: So now I'm on the next question...

LD03: So now I'm going to look for a dollar value for how much we have used so far today. So I'll go under comparisons and all buildings cooling so that's pretty straight forward. Still trying to look for the Human Ecology Building on the list. (types into search bar). So now I just used this search tool and I'm looking at the overall Human Ecology Building, which is exactly what I was looking for. Now I found it so, that's good. So everything I need should be on here, which is pretty neat. And now I'm looking at the water consumption for the Human Ecology Building as of today. Heating, cooling. Um, so now that I'm on the page for the building itself, it's fairly easy to look at stuff, the graphs are pretty nice and definitely the snow, or the rain that's pretty cool. So cooling maximum demand, all right so the graphs definitely help find what I'm looking for. Though it's not clear where I can look for how much each BTU is costing in terms of money. So let's see, oh there we go. So even though this kind of tells me how much dollars have been consumed so far, it doesn't give me a dollar value for what I've consumed in that particular hour, which is pretty interesting. The graphs are kind of spread out over 2 hours, so I'm not sure if I'm looking at, it tells me if I'm looking at 9 or 10, but it presumes 1 hour into 1 chart. So, okay.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

LD03: Now moving on to the next question...

LD03: So now I don't know what to do, I'm just going to look at the whole year, and again that was pretty easy, I just had to look at the year tab. It has only 2 months.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

LD03: Now I'm moving on to the next question, so again I just to, it's pretty straightforward on the home page of the Human Ecology Building. Looking at monthly data for heating, which is again easy to find. The graphs are very nice, pre-apt, I like that they show coal on them. So now I have to look at the monthly data, which once again pretty straight forward. So again the days are skip a day, so every other day, I mean I can tell which day it is, it would nice to be able to tell this was on the 2nd, on the 3rd, instead of having the bars and just one number on top. And I can't tell which day is higher just looking at them.

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

LD03: Okay, moving onto the next question...

LD03: It seems I should go back to the homepage because I have to look at a different set of buildings now. Still loading...I think it would definitely be useful to have a select your building right on top, instead of having to search for it because when I click on the building names, it doesn't take me to the building home page and that makes it harder to look, if I'm just looking for one building. Now I have to look for comparisons, which is not fairly easy. I'm on the comparisons page. It's fairly easy to find what I'm looking for. All right so now I'm on the next question....

7. Lake source cooling represents the following % reduction in energy use for campus cooling. _ %

Transcription:

LD03: So this one asks me to look at lake source cooling and I was not aware that I could find where the source of our energy is, which is really awesome. And since it's not a building, I'm gonna guess. I'm gonna have to look at ground facilities (navigated away from page). So now I'm not clear if I should stay on this website, or take one of the links that are on the homepage, but I'm gonna look here for another minute (energy dashboard) if I don't find it here, I'll just find it somewhere else. All right, (searches in search bar). All right so definitely seems like this particular information is not on the dashboard, it would be cool to have it there, if it is there, it would be cool to find it. So I'm just going to use one of the links down here to look at Cornell facilities services (types in lakes source into search bar). All right so I think the link I had to take was definitely the right one. I just had to use the search bar on the energy and sustainability website. So no I'm on the next question...

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

LD03: And this doesn't really, let's see. All right so the information for this question is pretty straightforward since the information is right on the homepage. I can see why this website exists in the first place, so I'm just gonna use that information.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

LD03: Now I'm on the next question...

LD03: It seems that again that's pretty easy if I scroll down the homepage, there are plenty of easy do-it-yourself options that you can use, so that's good again. The icons are pretty well laid out, and intuitive, I like the fact that I can see how many people have committed to it because that tells me what the most popular options might be, what the easiest options might be. Since a lot of people are doing it, maybe I should do it too. It's definitely an interesting

behavioral thing going on. You could kind of turn this into a social networking thing if you connect it to Facebook or something, but yeah that's cool.

END OF TASK ANALYSIS

Participant: LD03

Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

LD03: Overall I would say I agree with that. Yeah it seems yeah the graphics are definitely helpful overall its pretty well laid out some of the factors are kind of distracting but overall it seems fine.

I01: Could you specify what was distracting?

LD03: Yeah, the background. Like if this were just a full page, it would kind of help me. Also I mean this is cool that you have that (he is referring the “scroll over effects” on the pictures of campus buildings at top of the page) but I think it would be much easier if you just had a tab that said *find your building* and people would use that instead of having this (“scroll over effects”).

I01: That it was just there?

LD03: Exactly. Yeah so, if there was a button that said *find your building* like very prominently I could just do that.

I01: What if the map were the default? That is also confusing?

LD03: Yeah I'm a maps person so I would like it. But I do not think that it is clear why the map is there. What is it telling you? For that matter it isn't really clear why this is here either (referring to the top half of the website). But if you had something that said well find out how much this uses or something of that sort which clearly tells me why I would like to look at a building. Because if I were just at random looking at this dashboard I wouldn't think of how looking up how much my dorm uses or how much Baker Lab uses.

2. The layout of this website is well organized.

LD03: I think I am kind of neutral on that. Actually I agree the layout was pretty well organized. Once I found my way around the website I think it was fine. The first five minutes I was like: okay, what is happening? There is a lot of information. I am fairly familiar with energy efficiency stuff cause I work with

cooperative extension on that but if I was someone who has no idea what this was I wouldn't even know what a kilowatt-hour is or what is a BTU. So I think stuff like that if we had some basic definitions on the terms that are pretty commonly used in energy efficiency or energy use that would be very helpful. So that would be very helpful. And then the tabs again. So since I understood that the website was kind of organized around a tab structure, and I just had to click different tabs to get to the information that was easy but it took me a couple of minutes to understand that I could just look at a building and find out how much it was using. That is why the first two questions were hard because I didn't know that... understood that I could look at each building separately so I think that part of the layout. I also wasn't sure what each type of energy was... but once you get to know it, it is fairly true.

I01: Do you think it is worth it or do you think people would quit? So that after the first two minutes people would quit?

LD03: Umm... Maybe. Like I said I might be a little bit bias because like I said I actually work on this stuff. So I would be interested in looking at what is going on. I know that you guys put up a computer in the Commons last semester and I would look at that sometimes. I mean used it complete once. I would just stare at the graphics and maybe look at what was going on. I mean yeah I don't know if people would actually take ... I think they would need to have a reason to look at this in the first place. If they were actually facilities person that's good because you are actually interested on what's going on with the building. But if you are just a student you don't stay in Baker Lab or whatever so you probably wouldn't really care.

I01: Okay. So maybe you could just talk about how to make it more applicable to students as you go through the questions.

3. This website has appropriate use of color.

LD03: The website definitely has appropriate use of color. I don't think it was too colorful... I mean too, too colorful. It was colorful enough, I guess. The graphics had enough color in them and that was cool. I liked the graphics a lot.

4. The pages on this website are visually consistent.

(i.e. when I flip from page to page, they have a similar layout, look and feel which helps me find answers more quickly)

LD03: The pages on this website are visually consistent. Yeah the tab structure was kind of consistent along the entire thing. That is good because I can just flip through the tabs and I know that each tab would have different information.

I01: Did you catch the tab straight away or was it kind of hard to get them?

LD03: I did not know what each tab would tell me. So I just look through them. Once I understood what was going on it wasn't that bad. Because I knew if I said monthly it would tell me monthly. I mean this... I had to look at it a bit more closely than just the first glance but I think overall it was okay and it was definitely consistent.

I01: Do you think the homepage is giving you the larger picture? Or does it have you delve into details which are relevant?

LD03: Yes. I think it could be slightly less detailed, I think. Like I said, you have all of these building comparisons and stuff. The first thing I thought was okay I am just going to look for this data (he points to building comparison). I wasn't looking for the actual buildings. One good thing to do might be to find out how much energy Cornell uses in comparison to other universities. I know we are some 1% of all of upstate all of upstate New York state's energy consumption, not including NY City. Which is a great interesting fact. I thought wow we are using so much energy! So if we had something like that or comparing Cornell to other schools I think that would be interesting and that would give us a bigger picture. We could then go and look at the comparisons the weekly data, the monthly, the daily.

I01: Okay.

5. In general, this website has a good balance between graphical and textual information.

LD03: I think I'm going to be neutral on that. Because like I said that I don't think there were enough definitions involved, so some people might not know what a kilowatt hour is or what a BTU is... and how much energy that is in terms of let's say a light bulb which uses in so many kilowatts per hour or something of that sort. So, I think there should be slightly more text that explains what is included on the graphs. Because the graphs are...

I01: Standalone.

LD03: Yeah they are standalone. There is no explanation whether this is the total (referring to the comparisons tab). I mean it tells you from January to April but it could be more prominent.

I01: So this might be a way to discriminate whether this graph might be useful to you or not?

I01: Definitely. Yeah I think so. Even just two sentences that describe what this graph tells, what is the purpose of the graph, what are some of the terms that might be used in it. I think that would definitely just keep people thinking

about it. And it is easier to compare and engage people. So I think that would be good.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

LD03: What do they mean by various functions?

I01: The way you access information.

LD03: Okay, I mean it took me a while to understand. But once I got into it...I mean once I found out that I could look at each individual building, pretty easily, it was pretty easy to find out what I needed. Yeah I think it was pretty consistent.

7. Remembering where I am on this website is easy.

LD03: Umm, I think again I am neutral on that because again there is so much information that it might be confusing in terms of keeping track of what I'm seeing. Like what tabs have I gone through and where exactly I am.

ID01: Or like what you are looking for within each tab. That was maybe a bigger issue. How do I know what I'm going to find in each of the tabs?

LD03: Yeah I mean comparisons there is a lot here. Is what I am looking for, is that here? This is a comparison between buildings but it is not a comparison of intra-building information. So then where do I look for that? Well I have to look at the individual buildings. It might be easier to kind of click on that (Court K Bauer tab) and then it takes me to the individual building. So yeah it wasn't too hard but there is just so much information. Especially since I can customize it the information; it might be hard to keep track of what exactly I can change in order to see the graph that I'm seeing now. [Minute 33:30

ID01: So do you think less customizing might be more helpful?]

LD03: I guess it depends on exactly what I want from it. If I am looking for really specific information, then customization is great. If I don't care; If I only care for weekly data but not hourly data... I think it depends on what you're looking for. I think it would be good if there were an option but maybe there could be a way to make the simpler more straightforward things more prominent... and if you need to look at it (the dashboard) in more detail...it (could) open up another browser... and then you can play around with the building data or the comparison data. So if this were just monthly data [Min 34:29,

ID01: You mean breaking it down...?

LD03: I think one good example is the National Map Bureau, the national GIS maps have options that you can play around with so if you were looking for something very easy (to find) it is right there on the map. (On the other hand) if you are looking for something specific then you can, say well, customize it and you get all of the options that I you looking for. So that would be good.

8. The organization of the menus or information on each page seems quite logical.

LD03: Yeah it seems pretty straightforward. After the first couple of minutes... Hahaha.

9. Few mouse clicks are needed to find a given piece of information on this site.

LD03: It says few mouse clicks are needed to find a given piece of information on this site. I think so I would agree I mean in terms of the ones I know where to find all the information how to find all the information. For example I didn't notice the search bar near the top at the beginning so I didn't know that I could search for building, but now that I know it's there I think it is pretty easy once I go into the building information I can just kind of search through that and then I can just kind of find the building information for that exact building. So I think it is not that bad. So I would agree few mouse clicks are needed.

10. I am engaged when using the website.

LD03: Umm again... I might be slightly biased towards information about energy efficiency. Once I got into the website I was really amazed by how much information I could compare. I mean I am guessing this is kind of a beta version, but once it goes live I think it would be really, really cool to see how much money was consumed. I think that has a very of a strong ethos ... I mean, (it has) some very strong information that groups on campus could use.

III. Content

11. I understood the purpose of this website.

LD03: Well I would agree with that. But I don't know if ... I mean I agree that the purpose is to put out all this information and help people compare and help people think about their energy use. I don't know how effective that is in behavioral change so that is one thing so yeah. So I'm just going to write that comment down. And it is cool that you have a per-person breakdown because when I am using one of those buildings I can understand how much energy I might be using on average.

12. The information I found meets my needs.

LD03: I think the information I found I don't know if it meets my needs. I don't know what I am looking for in this case. But as far as how much energy I am using definitely it does so I agree with that statement. I also think that even though it did meet my needs, I don't know what I am going to do with that information.

So if the conservation actions that that you cut down on energy use... if those were slightly more prominent I think that would be very helpful.

13. I felt information presented by this website is meant for a more technical audience.

LD03: I think so. I think it is meant for a more technical audience in the way it is set up right now it is kind of confusing if you are not committed to finding out about energy use it would be kind of hard to keep going. Like I said earlier I think it would be useful to have an explanation of all the terms and all the grass in there so that anyone could just kind of go over it and understand what was happening. So yeah, slightly technical.

14. I find it was difficult to relate to the energy units presented.

LD03: Yeah definitely agree yeah and earlier comment was that if I knew ... my daily electricity use in terms of ... my earlier comment was ... in terms of a light bulb or a charger or something... how much is 1 kW hour... I think that would be very helpful to have that kind of thing to relate to. So yeah, more information on what each energy unit represents would be definitely helpful.

IV. Usefulness

15. I found this website useful.

LD03: Yeah I mean if I was just looking for energy information. Again this website is really helpful useful. I know that for a facility services it is amazing because they can compare how much energy they are using and look for ways to cut down on that.

I01: Could you elaborate a little bit on that?

LD03: So let's see if I were a staff or part of Cornell facilities and you're looking for ways to cut down on energy use I know they put out meters that give you instantaneous readings in all the buildings. So that's amazing because if I wanted to find out what time today I am using the most amount of energy. It is really helpful to know that because if it is at 2 AM in the night we can ask what is happening at 2 AM in the night? Maybe... the water tanks are getting filled or building is being heated before it cools out for the night... or something of that sort. So it is great to know where exactly you know how much I am using per person; It is just good to compare because if there is any kind of an outlier in the data, then you can think about why that happened and ways to avoid using that much energy the next time.

I01: But for an individual, such as conveying this to an individual?]

LD03: Like a student or something? Yeah again I mean I don't know what I would be looking for as a student. I like I said in our previous conversation... if this were

not just about the energy use but also about ways that a student could contribute to reducing energy use... If the commit to conserve part was slightly more prominent I mean it is on the homepage but it is not a whole page by itself. So if there were ways to do that, I think it would be more engaging for a student... Then they would find the energy information more useful as well because then they would know where energy is being spent. For example I live in Becker. So I know how much energy I am using as a Becker resident and then how I can cut down on that... and each section would tell me... I think this does tell me... if this told me how much energy I was saving so using a desk lamp that saves you so many kilowatt hours per day or something. Then I would know how much energy I am saving which is kind of a powerful incentive to save it. So yeah that would definitely be helpful.

16. I would use this website on a routine basis.

LD03: Yeah I found this website helpful ... I would probably use it on a routine basis. I don't know if once a week... maybe once a month? But then again it depends on what kind of information I am looking for. If I was more, I guess, invested in making this initiative and various changes on a personal level... Whether it be for work or for a class or something I would use it more. It is definitely a powerful, powerful website. Yeah.

17. Identify one energy-conservation tip provided by this website.

LD03: I'm just going to say biking since that is what I do.

18. Please identify the feature of this website you found most useful.

LD03: I think what was most useful was probably the fact that I could see how much energy I was using that I could compare and then I could also see how much CO₂ that was emitting and how much money that cost. So that comparison tool is definitely very, very helpful.

19. Please identify the feature of this website you found least useful.

LD03: Lets see... I don't know, I think overall it's pretty useful. I think the least useful would be something that was the most distracting which was the homepage on which there were so many graphs that I just stayed there and I didn't move beyond that for a couple of minutes... I just trying to find my way around windows I'm trying to find the information that I needed from them even though I didn't have that. I think it is useful just not there (right on the main homepage).

END OF POST TEST INTERVIEW

Participant: LD04

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

LD04: Going to the Human Ecology Building, I like all the pictures of the different houses and halls on top. Except I don't like that there's not a search bar where I can search to find Human Ecology, instead I have to keep clicking, and the bar does scroll, but still.

LD04: So I'm going to open the Human Ecology Building and click on it, it's loading Human Ecology Building with data. Okay, so I like the top bars, but things on the bottom, all this extra discussion stuff is a little distracting to me.

LD04: Actually it's highest right now, so far, at 10am.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

LD04: Well I see "today" maybe under "comparison." Okay, that didn't work because it just brought up different houses, so it looks nice, it's really pretty. However, I cannot find a comparison between today and yesterday. Maybe if I just click on electricity. Oh, I see up top I can click on "week" that's what it was. Yeah, that distracted me. I didn't see that "week" 'cause there was no comparison there. All right so today is today, so far today's electricity consumption has decreased compared to yesterday, but that's because we're only at 10am and yesterday had a full day. So it's not a very fair comparison. Maybe it would be helpful to see a chart for Monday and a chart for Tuesday.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

LD04: All right moving on, now I'm moving on to question 3...

LD04: Okay, so I like the bar on top with "electricity, heating, cooling" that's very clear, so I can just switch over to "cooling." And it switched back to today, which is what I need, today's maximum demand for cooling is equivalent to... oh I see, so those numbers on the left didn't make a lot of sense (of bar graph), but I see this picture on the right, it's telling me that I could put it in different terms like "CO₂" or "dollars," which is helpful, and I saw that right away. But it would have been helpful if there were also changing units on the side of the chart, so that I knew immediately and I didn't miss that dollars thing over there. So, dollars, the highest...oh the chart didn't even change, or I don't understand what the chart is even measuring, what's this 35, 71... Okay it is in kBTU's but it didn't change to dollars. Oh, ah, that's difficult. Okay, so now I understand if I hover over a bar, it tells me the dollars in this little box over here on the right. However, it still shows me the number in kBTU's, which I have no idea what it is right now. But the highest looks like 11:39 or oh, dollar per hour, what's the question... Confusing, well that would be \$1.4 dollars an hour. Um, I don't know, this is hard. The falling coins are annoying me... I don't like all these falling coins. 144 is the highest, oh no, it just re-did itself, okay, 144 is the highest, but oh, I guess I could subtract, that's what I could do, that's what I'm gonna have to do. It would be the highest so far, today's maximum demand for cooling. Okay, I don't really understand, the question wants the total dollars so far, or the maximum hour in dollars. Well anyway, I think its 11.39 minus 8.63, which would equal, didn't know I was going to have to do math. I'm obviously not interpreting this question correctly because I doubt you're going to ask me to do math. All right \$3.66 per hour.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

LD04: I'm moving on to question 4...

LD04: All righty months, this is not helpful (bar graph), oh I had to hit "year." Okay, year not month, which is confusing, because if you ask about a month you think "I'm going to hit month," but it doesn't work because that just gave you days, not month, so I had to hit "year," which I didn't like, and there's only 2 months there and March is higher than April, so I'm going to put March because April's not done, so that's probably why it's highest.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

LD04: Anyways, I'm going to move on to question 5...

LD04: All right so I'm going to click on "heating," which again is easy, but I'm basically ignoring everything below this chart. I don't really like this black box in the background below the clock tower. It's kinda weird, either make it all the clock tower, or make it all black, this whole cut half thing it's distracting. Wow, that's an interesting picture (coal). What's my question... so now I know I have to go to "month" because I already made the mistake the first time. What day of the month, well it was actually the 2nd and the 3rd. Let's see which one's higher, that's nice when I hover over it the number pops up because I can easily compare. So it was the 3rd day, the 3rd day!

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

LD04: All right I'm moving on to question 6...

LD04: Okay, so first I need to find out who's the highest consuming are, so I need to go back to "electricity," I'm assuming. And then I need to go to the residence hall buildings. And I scroll down. All right, so the highest one is definitely Carl Becker, so can I click it from here? I don't know, can I add it to a graph? Not very helpful, let's see what these buttons do, "total," ah! I can change it to "per person!" Hooray! Okay, so I found it, although it was tricky because who knew it would be under that drop down menu, so I didn't really like that. Also, what is that next to that "per person" thing, it looks like a door, but it's "accumulation" or "average hourly rate." That's tough, that chart thing, that's doable I guess, I can understand after I click on it since it explains. All righty, so Carl Becker has 1,775.

7. Lake source cooling represents the following % reduction in energy use for campus cooling. _ %

Transcription:

LD04: I'm going to move on to question 7.

LD04: All right I feel like these questions are probably getting harder. I'm going to go to cooling because, okay, that's just my first guess. And looks like that does absolutely nothing for me. So I'm going to keep scrolling down, no I'm not going to keep scrolling down. Perhaps "sustainability" will be where I need to go here. Sounds like a... guess not, not really helpful. "Competition" what's that? Well, that's cool, but again, not helpful. So, homepage, maybe. Okay, I definitely have no idea where to go, let me read the question again...sounds like a "sustainability" thing, right, but all sustainability is a bunch of pictures. So let me go back to "cooling." I don't really see anything having to do with "lake source" stuff. Maybe go back to "comparisons," go back to "cooling." See if I can find anything. Total, doesn't do anything for me, this, doesn't do anything for me. Tough one. So finding buildings, unhelpful. Electricity, heating, cooling unhelpful. The drop down, the search bar up top is just for

buildings, there's Facebook, but there's nothing that talks about lake source cooling. I'm gonna go back to the homepage because I don't see anything here... "the 89 square foot building" by the way that is a typo, probably needs to be "building" not "buildinf" ... "provides high tech research laboratories, multi-purpose classrooms..." oh they're just talking about Human Ecology Building. All righty they wrote a nice little thing there. Maybe it's under this "commit to conserve" button, it feels like that's the only thing I haven't checked. Go tray less, recycle, use a bicycle... want to ride my bicycle, visit this website, engage in conversation... take showers, turn off the thing, do this, no! That is not it. All right "budget" "goal." Average days, worse than average days. Okay this is severely hidden. I don't know where you put this at. Is it on the twitter feed? 'Cause [/because/] that would just be silly. I'm going to check it because I am determined to try it all before I give up. Okay, got nothing there, none there. What if I close this message-window? Got nothing. Keep going up, all right it's looking like I'm not going to find this thing. "Layers" what's that, "show forecast," "show previous day," oh hey look, it did do that previous day thing. That's cool. "Show outdoor temperature." That's also cool. All right, I clicked on everything, not happening. "Menu" no.. All right, well I think it should be under "sustainability" that's my choice to where it should be, but it's not. Climate action plan, "CAP brings together campus stewardship for low impact behavior.. in 2 short years Cornell reduced it's campus greenhouse gas emissions by 25% through smart investments." That's the first time I've actually seen something talking about something. Perhaps! If I change the pictures...awweee... I found it! That took far too long, who knew you had to click on a picture of a lake source cooling in order to find out how much. I can't believe I found it, I'm so happy. Okay, lake source cooling, "with it's start up in July..." All right 86% reduction. Whew! That was tough.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

LD04: I'm moving on to question 8...

LD04: Mission of this website is to educate and motivate students and Cornell as a whole and sustainability... electricity, heating.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

LD04: Well, honestly I think the best way is the competition, motivation to, if students see building, their building and they're proud.

END OF TASK ANALYSIS

Participant: LD04

Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

LD04: I am going to say agree. Because I like the font and the graphics but it is a lot for one page.

2. The layout of this website is well organized.

LD04: The layout of this website is well organized. I would say the top-half, the electricity, the heating, cooling and the homepage, comparisons, competition, unsustainability that stuff I think is all very well organized. I'm going to say I agree.

3. This website has appropriate use of color.

LD04: This website has appropriate use of color. Yeah. Good color. Yeah I agree. Nice colors. It makes my eyes look good.

4. The pages on this website are visually consistent.

LD04: The pages on this website are visually consistent. Well the comparison... I would say I agree except for sustainability.

5. In general, this website has a good balance between graphical and textual information.

LD04: In general this website has a good balance between graphical and textual information. Yeah. True.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

LD04: All right agree except for (the) sustainability (tab). (Should be) less paragraph based.

7. Remembering where I am on this website is easy.

LD04: Remembering where I am on this website is easy. You know I like the electricity, heating and cooling but um, yeah I think it is... I agree. It is pretty clear that you are in the Human Ecology Building.. it is on top and that looks nice. I am not so sure where to go if I click that campus sustainability Cornell. Like, would I go back to the main page? Because I wouldn't see you but it doesn't say dashboard home or anything but I don't know I would make that like the home so that I know that I go back. All right.

8. The organization of the menus or information on each page seems quite logical.

LD04: The organization of the menus or information on each page seems quite logical. Let's see. The homepage. Homepage. No verbal response given.

9. Few mouse clicks are needed to find a given piece of information on this site.

LD04: I agree. No other verbal response given.

10. I am engaged when using the website.

LD04: It is interesting. I am engaged. All right. No other verbal response given.

III. Content

11. I understood the purpose of this website.

LD04: I understood the purpose of this website. Well I hope I understood it. Haha. I need a sip of coffee. Let me get a sip of coffee. I agree. Explain, Umm. This is really cool that we have this information first of all. Writes answer. No other verbal response given.

12. The information I found meets my needs.

LD04: The information I found meets my needs. All right well... like are you saying do I find this relevant? Something I would need? Yeah. I think yes. Writes answer. No other verbal response given.

13. I felt information presented by this website is meant for a more technical audience.

LD04: I disagree. No other verbal response given.

14. I find it was difficult to relate to the energy units presented.

LD04: I found it was difficult to relate to the energy units presented. Ummm.. the kBTUs I didn't get the kBTUs.

IV. Usefulness

15. I found this website useful.

LD04: Yes. I found this website useful. Yeah. Definitely.

16. I would use this website on a routine basis.

LD04: I would use this website on a routine basis. Um probably... No other verbal response given.

17. Identify one energy-conservation tip provided by this website:

LD04: Identify one energy conservation tip provided by this website. Okay. I know where that is. No other verbal response given.

18. Please identify the feature of this website you found most useful:

LD04: No verbal response given.

19. Please identify the feature of this website you found least useful:

LD04: No verbal response given.

END OF POST TEST INTERVIEW

Participant: LD05

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

LD05: It looks like they want AM and PM. So I've never used anything like this before, it looks really nice. Let's see BioTech, Boyce, Carl Becker, it is alphabetical, okay, Human Ecology, here it is. Looks pretty straightforward. So it looks like we have a graph of today's electricity usage and I'm looking for the time it was highest today. So it looks like it was highest at 1:45 and that's about 240 kW.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

LD05: So it looks like I can click on "week" oh, show previous day, how about that. That was a little confusing. I wasn't sure what layer. Hmm, okay, layer on. So it looks like orange is today and grey is yesterday, well it looks like in some parts in the day it increased or decreased. Hmm, I'm going to say that it has increased today so far though the day isn't over yet so we can't really tell, but definitely at the highest part it's increased.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

LD05: All right, I see "cooling" over here, very easy very nice. Nice little icon there I like that. Maximum demand it looks like its at 3pm, maybe I can click on that, oh, I see BTU, CO₂ and dollars. Click on that ah, okay it says \$31.65 today, ha ha, it's a very funny graphic, I like it. Okay, so I think, ah okay, interesting, I'm guessing that whenever I put my mouse over a specific hour it gives me

the dollars for that hour, and when I take it off, it gives me so far today. So \$31.65.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

LD05: Okay question 4...

LD05: Oka, I'm still on "cooling" and it looks like I can click over here. And, oh, year, I should go to year, okay starts in March, we don't have anything for January or February, we have March and April, and April's not over so far, but right now March has had the highest demand for "cooling." Except that might change by the end of the month since it is getting hotter.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

LD05: So now question 5...

LD05: Looks like I go over to "heating" very convenient. Looks like some burning coals in the picture, cute. So I go to month, it looks like preliminarily it's a tie between day 2 and 3. Day 2 had 58, 057, day 3, oh, okay that's weird. Okay, this is actually kind of confusing, I don't actually know what a kBTU is, but it looks like the numbers are going up when the bar goes down, I don't know if this is normal or not. Let's look at dollars again because that makes more sense to me. Okay, interesting. So the dollars increase as the bars go down. I am very confused right now. Okay, well I'll say the 19th because it had, wait...oh my gosh. Hmm, ok a tie between the 2nd and 3rd day. This part of the website was a bit confusing for me, possibly because I don't understand what these units are.

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

LD05: Okay, next question...

LD05: Oh, okay. Sort of sounds like I'm not going to be looking at the Human Ecology building anymore. I'm not entirely sure how to go back, it looks like next to the search bar I can scroll down and look at all the different buildings, residence halls are all the way at the top. Looks like just West residence halls. So I guess I'll look through all of them. Okay, January 1st to April 1st... okay, year. Okay, Alice Cook used, oh "comparisons" oh my gosh, I almost didn't even see it. That makes things a lot easier. It looks like Carl Becker had the most electricity usage. I think. Oh "per person," yes Carl Becker definitely. Okay 1,780 kWh per person. I'm going to assume that's the same thing.

7. Lake source cooling represents the following % reduction in energy use for campus cooling. _ %

Transcription:

LD05: .All right, let's see maybe I can click on "cooling." Interesting, I'm not entirely sure how to find it, but maybe I can type in... no. Okay, campus cooling, maybe...go down to Cornell. Let's see I'm clicking on "sustainability." Oh, that's a nice picture, I actually know some people in that picture, climate action plan, but that is not my answer. And I'm still looking for where "lake source cooling" is. "All buildings cooling" let's see they still look like buildings, interesting. Hmm, oh here is "commit to conserve" I don't think I'm going to find my answer here either, no. If only there was a search for other than finding buildings. Let' see (tries to type in). Interesting, let me read the question again. Okay, maybe I should just go back to Human Ecology building. Interesting, hmm still having trouble finding this. Getting slightly frustrated. Not giving up yet. Okay here's some links, look at "energy and sustainability." I am no longer on the dashboard, oh, something about Cayuga Lake. Oh! Lake source cooling facility. Okay. Lake source cooling permit allows lake study to move forward. Let's see, no that wasn't particularly helpful. But there is a lake source cooling building. Oh, okay. I will look for like 2 more minutes. I think that on this page, they should continue the picture (clock tower). It's a little abrupt. Okay, I'm looking at "sustainable campus" right now (participant browses links off of the main dashboard), which is pretty cool. Wonder if I can just do a search for lake source cooling, let's see... "water," oh okay water, lake source cooling permit, again, I think I read that. Okay I am going to search Cornell now for "lake source cooling," and I found a link, clicking on it. This looks like the layout of the regular Cornell page, pretty basic, not too bad, and it is not loading. Hmm, application error. "Water" okay here we go, providing summer cooling with 86% less energy than chillers. Oh my gosh looks like I found it, just needed to search a little more. After that long, arduous journey, I'm on to question 8...

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

LD05: Okay, well to me it looks like the point of the website is to make people particularly Cornelians more aware of energy use, be able to reduce energy use on campus. It's pretty cool being able to see all of this. I'll write that down. (went to homepage) A space for Cornelians and the public can learn about energy consumption around Cornell's campus.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

LD05: Okay, well there's this handy little part on the front page "commit to conserve" and it gives me a whole list of things to commit to conserve energy. Such as

“use a desk lamp instead of an overhead light” I do that. “Use a power strip to completely shut off power to computers and other appliances” I do not do that, but that would be good. “Natural daylight whenever possible.” Cool. So it gives me a list of energy saving tips and activities, and I can click “commit” and I wonder what that would do. Oh, I always take the stairs instead of the elevator. I’ll click “commit” and see what happens. Okay, I can log in on Facebook, I don’t want to do that right now, but that’s cool. I can choose to commit over Facebook. And that was the last question.

END OF TASK ANALYSIS

Participant: LD05
Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

LD05: I actually say strongly agree because of the pictures were so cute is heating and cooling I like that

2. The layout of this website is well organized.

LD05: I would give this and agree. Because some things were a little bit harder than others to find but I really like the idea of the website.

3. This website has appropriate use of color.

LD05: I'd say I agree. I like the Cornell theme. And I like the green and red as opposites, if that makes sense.

4. The pages on this website are visually consistent.

LD05: Let's see. Yes they look pretty similar. I would say strongly agree.

5. In general, this website has a good balance between graphical and textual information.

LD05: I would agree I really like the use of pictures. The text is not too long but not too terse. It's pretty much gave me the information that I needed. I would say I strongly agree

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

LD05: Yeah I would say I strongly agree with that other than the lake question. So I would see how could it be improved. One thing to do would be to put everything on the energy dashboard website. Not necessarily make one for outsource to different websites. So keep all information on the dashboard and limit outside sources.

7. Remembering where I am on this website is easy.

LD05: I would say that I agree. Because sometimes I didn't realize that I had gone to the main page because they do look very similar

8. The organization of the menus or information on each page seems quite logical.

LD05: Oh yes. I would say that it does seem pretty logical. It goes from day to week to month to year. And it gives me different options so yeah sure strongly agree

9. Few mouse clicks are needed to find a given piece of information on this site.

LD05: Most of the time, yes. But certain times you know, specifically on the late question, I'm going to say neutral. Because most of the time it was good, but with that question I was just really stumped.

10. I am engaged when using the website.

LD05: Oh definitely. Animation pictures. Definitely. Best part. And I think that the concept is very interesting anyways I'm very interested in energy usage not to need to shower

III. Content

11. I understood the purpose of this website.

LD05: I say I agree it tells me to explain I'd say that the website excess sustainable Cornell up there so it's about learning about energy consumption on campus.

12. The information I found meets my needs.

LD05: Yes. Definitely. Even if it was hard to find I eventually found all information that I needed. 31.40 missing info. Purse so nearly personally does this information meet my needs I say Jess I am definitely very interested in conserving energy on campus so I am personally interested in the information given.

13. I felt information presented by this website is meant for a more technical audience.

LD05: I would agree because... Actually I would say neutral. Because although the pictures which I am ranting and raving about were very accessible I thought that some of the terminology used was not, I did not know what BTUs are

although ISU Monday are some unit of energy but it would be nice if it was explained although I could look that up.

14. I find it was difficult to relate to the energy units presented.

LD05: Strongly agree I had no idea what the units were strongly agree. As I just said I had no idea what they were other than the dollars and CO₂ but I guess it's still kind of abstract for me to understand that.

IV. Usefulness

15. I found this website useful.

It is wonderful that all the information is available like this. Yeah.

16. I would use this website on a routine basis.

LD05: I would use this website on a routine basis you. I probably wouldn't. Oh okay once a week once a month several times a semester one once a semester never. I would probably look at it several times a semester just because I would be interested in seeing and comparing because I like to do that but otherwise I would really feel the need to look at it once a week

17. Identify one energy-conservation tip provided by this website:

LD05: Take the stairs instead of the elevator. Those steps are so helpful. I actually really enjoyed that part it was very nice.

18. Please identify the feature of this website you found most useful:

LD05: The feature I found most useful was probably the comparisons between the buildings. I thought it was really interesting to see who uses some moments, who uses the least and in that the competition. I guess I heard there was a competition on the north dining hall or the north residence halls but it looks like this is all campus so that's really cool. Unfortunately as I said my dorm's place number 15

19. Please identify the feature of this website you found least useful:

LD05: Well let's take a look. Okay easily. Maybe not easily. (She looks through the sustainability tab.) I should have looked there it is the lake source cooling. I just assumed it was pictures of the climate action plan I feel pretty silly now. Ha. Well that's pretty cool. Wow why did I never look at that oh that's pretty where it says oh New York City. She looks at Cornell New York Tech campus. This would have been so useful if I paid more attention to it. Actually the sustainability tab is not that useful to me because I don't know that these are different sustainable initiatives I just looking at the pictures. Although they are useful now that I know what they are for.

END OF POST TEST INTERVIEW

Participant: LD06

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

LD06: So on the main screen I don't see anything for time, but I do see it for building for today. Let's see for the Human Ecology Building... so I am under "comparisons" I'm gonna look at "electricity academic building" on the left side, which is lovely. It's very easy to compare because I know that Human Ecology is in "academic building electricity." Um, let's see so we have all these lovely buildings, so I'm guess Martha Van Rensselaer is the Human Ecology Building, it says zero kW, which doesn't make sense. I'm gonna look at the 3 tabs at the top and see if any of them can help me. "Hourly rates" there we go, but I don't want "hourly rates". I want for today. Let's see, so again I have it alphabetize, I'm gonna "add to graph" and there's no data displayed. Hmm. Curious. Okay, so under April I'm gonna try "all buildings electricity" see what I can get, if there's any difference here. So we have Human Ecology Building, here we go, "add to graph." So I have the graph of the Human Ecology Building and I am dragging the cursor along. It's skipping, I don't like that. Let's see if I can get April specifically here, let's try today, we'll try that one. So today, there we go, so I have the graph today. That was a little difficult to find for me. Okay, so that's the correct graph, so the graph is relatively easy to find out which one is the highest, it says 4:30pm today was the highest. So I am gonna write that as my answer.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

LD06: Moving on to question 2...

LD06: So on the top you can do it by “today” or a “custom period,” so I’m gonna go to “custom period” and that’s very clearly labeled, good stuff. And the start date, let’s see, I am gonna put in yesterday, so it was the 23rd, very easy, they use the map. And today the 24th, 6pm so I’m gonna “go.” Okay, um so the map popped up and trying to figure out where this ends. Okay so I have the graph it’s very difficult to compare them on the graph let’s see if I can get my average, no. You know what I’m gonna use the “average hourly rate” for the 2 days. For today, the “average hourly rate” for usage of energy was 225 kW/hr. And then yesterday’s, let’s see, so I’m just gonna use the arrows, which works as well, let’s see “custom period” again using the calendar in the “customer period,” we’ll go to April the 23rd and end with April 23rd. I’m gonna use the time period now for a more accurate comparison (6pm). We’ll see. The graph is up and we have 222, so it looks like the electricity consumption has increased compared to yesterday. Done with question 2, so far very straightforward under the “comparisons” tab. Great.

3. Today’s maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

LD06: Moving on to question 3...

LD06: Okay so I’m looking for maximum demand for cooling, so there’s a... again under “comparisons” “all buildings cooling,” very straight forward, just click on that, and then I’m gonna scroll down and find the Human Ecology Building. Okay, so let’s see. So we have the Human Ecology Building, I am going to go back to today and we have scrolling down, 231 kBTUs/hr. Okay, so let’s see so this doesn’t seem to be answering what I need it to, so I’m gonna go to the top and scroll along all the different buildings. Here we go Human Ecology Building, I’m gonna open that and see what comes up. See if this has what I want. So hmm, okay we have kW usage, and look at that, right on the bottom there’s money, so I’m gonna hit “cooling” on the top, again very straight forward, and I see my graph and I am going to hit money sign, and it will tell me. It’s \$3.4 per hour, no \$42.11, and you can just slide over the different times when it was the highest and calculate how much it is. Oh, that’s actually pretty cool, um yeah, so it looks like the average is 3.4, but it’s asking for the maximum demand. So the maximum demand today came at 3pm and that was at 576 kBTUs. On the right hand side of the screen it tells me how much it was per hour, which was \$5.8 per hour, and at that point it was \$30.47, so maximum demand.. I don’t know. I don’t know what the question’s asking. As of today it was \$42.11 but the highest, it was \$5.8 for the maximum amount when we used it the most, but it’s a total of \$42.11 so far, so I think I will

answer. I don't know if it's asking at the point where it had the highest demand or highest usage, or if it's asking for today in general, it's not made very clear on the screen what the maximum demand for cooling is, but that might just be my lack of knowledge, hee-hee. Um, okay so I'm gonna stick with the maximum hour and that was \$5.8 at 4pm, so, 3pm.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

LD06: Moving on to question 4...

LD06: So it's over the past year, so this is "today," but I can hit "year" so it can show me each month. It's done this, money. I want BTU again. It started in March, is there any other... huh, so it's only showing 2 months of the past year. Um, let's see for the "cooling" I have it on the BTU again. According to this it's March, but that's only 3 months, so I'm gonna try "comparisons" and see if I can get more months. I'm gonna go to "cooling" under "comparisons" tab and I am going to see if I can go to "last 12 months." Let's see I'm gonna drag the arrow over and extend it all the way to May, so May to April of all last year, I have it by the "total" I should probably have it by the month. So I have, I want the Human Ecology Building, let's see, okay so let's see if I can find this building...oh there we go Human Ecology Building, I'm going to "add to the graph" and the graph is going to pop up, yeah, they only have until February, there's only 2 months available. So my answer is going to have to be, when was this, March had like it had some really high stuff going on starting on March 11th, so I'm gonna say march because I'm assuming I count up to that part. Unless it decreased, oh no, it decreased a lot. Yeah, let's see, let's try and limit this down to just March and see what happens, so looking at his, and sliding that over, sliding the tabs over the two days. I am looking at, so for March, I'm just gonna slide down on this lovely thing and try and find, it would be nice if this was alphabetical, but I don't really know how to organize this. So Human Ecology during that time was 92,835. So again, shrinking it and going to where we are now. We are at let's see, 75,000, I mean it hasn't been a full month. There's only 2 months for "cooling" and so it would be March.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

LD06: So onto question 5...

LD06: So we're moving to "heating." So I am going to try again to use the to thing seeing how I have Human Ecology Building selected. So I'm gonna hit the "heating" tab, lovely design of graphs and such, and it's for today. So on the bottom there's the "month" option, so I'm gonna hit the "month" option and

the graph will pop up for me. Lovely. And you can see that the highest day were the 2nd or the 3rd. So it looks like it would be the 3rd, it pops up and tells you the numbers, which is nice; however, it doesn't tell you the date, you kind of have to guess based on the top, which you can do. So yeah, it looks like it's the 3rd bar, I'm assuming each bar is for a certain day because of how it's organized. So it's the 3rd, that's the day I'm gonna say for April. This could use the month on it, I'm pretty sure I'm on April 'cause it's the most recent month and it only goes until the 24th which is today, but if it could say on the top what month we were doing, that would be awesome, just to make sure.

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

LD06: Moving onto question 6...

LD06: Okay so seeing as I was playing with this earlier, I'm gonna go to "comparisons" and I'm gonna hit "residence hall electricity." It has a specific date it wants me to use so I'm gonna move the little arrow thing over to January 1st, right there. Great, January 1st to April 24th. So with that, I am going to close this, I don't want that. So, I have the time date selected. So the highest energy consumption that's listed is Carl Becker so I'm gonna look there, specifically look at Carl Becker 'cause that's the total. I'm gonna hit the little toggle thing that says "total" and it has "per person" under it, and I'm gonna hit that. And the highest energy is still Carl Becker and it has the answer of 2257 kW/hr per person. So yeah.

7. Lake source cooling represents the following % reduction in energy use for campus cooling. _ %

Transcription:

LD06: Onto question 7...

LD06: Okay, this looks like a different kind of question than the comparison and number ones. So it says... so I'm looking for energy reduction use. I'm gonna start at the homepage and see what it comes up for me. So I think hmm, so we have our "budget" that, building log, the twitter feed, okay. So I am going to try to clear this by trying... yeah, so if you click the big arrow it goes back to Cornell. Yeah, so that's good. Okay I'm gonna look at "sustainability" tab because the search is only to find buildings. So let's see what the "sustainability" tab says. Lake source cooling... nope this just has the "climate action plan." Okay, so I'm gonna go back to the homepage because I'm assuming that's where I'm gonna try to find this. Um, let's see, reading through the dashboard, I don't see anything. Okay, there's links, I can try that, I don't know what to do, because if I hit it, I don't want to lose the dashboard, I don't know. I don't know how to right mouse click, I think it's nope... ah, there we go control. Okay so I am going to hit nope that's not what I want.

Okay, I do not know where this answer will be, there's no search box for this, I did the comparisons. Okay, so I guess I will go back to "comparisons" and see what's going on there, if I can do anything with "cooling." That's the next thing to check, no, nothing there. I'll try the "competition," it says "competition". Nope, nothing there. Back to homepage, huh, gosh, um, want to click on these, but I don't want to lose this. Okay so I'm gonna look over here (external link from dashboard), so let's try, so I clicked on a link. Let's look at water, we'll try water. That's water conservation, I don't want that. Hmm, I guess I will try the Cornell University sustainable design. I do not know where to look, I'm going to look for cooling. Hmm, let's see, so I will try a different link. Energy saving tips... there we go, there's "lake source cooling." Let's see look at page 8. Okay, so hmm. I don't know. That was the report. Lake source cooling, I am going to try to type this, oh look, I am going to search this in "energy and sustainability" and we're gonna see if this works. Okay, lake source cooling home, going to click on that, okay 86% reduction. Great. It was a little difficult to find the answer on that actual dashboard that was originally, but with the links, search Cornell, you can just type it into the search Cornell, which is nice, but there was no direct where should I go from there.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

LD06: Moving on to question 8...

LD06: It wants to know what the mission of this website is, it says in the homepage under the message window, right there that it's a "tool to demonstrate Cornell's leadership in environmental stewardship and sustainability." It gives data and raises awareness. The mission is pretty well stated on the homepage dashboard, but you can close that. So if you close it, I don't know if you would be able to get it back. So yeah, the mission is to provide data on energy usage and conservation and sustainability. I guess it's also kind of like a check, you can check up on what you're doing, which is nice. I like the numbers. I like the graphs. Okay.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

LD06: Moving on to question 9...

LD06: So I know on campus they have those programs, they have the competitions, which you can just click on. And you can see which building is doing the best for reductions, so if you can get everyone together you can definitely compete to reduce energy costs. That could be one way to do it. Let's see what the other things have to say, "sustainability" it tells you about the "climate action plan," which is for all of Ithaca, so probably if you were to search on other links you

could see how to do this. Um, yeah, so right on the front page it has “commit to conserve” so you can just use one of those. So I guess it has you “commit” I don’t know what happens if you click on it, but it makes you more aware of ways that you can actually reduce your energy consumption. It makes you aware by providing specific ways to reduce that can be found very clearly under “commit to conserve.” Also if you again, if you get the group of people together, you can look at that.

END OF TASK ANALYSIS

Participant: LD06

Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

LD06: Strongly agree. I definitely think that the design with the bar graph and the colors are very modern. They are very appealing easy to read. Put together very well.

2. The layout of this website is well organized.

LD06: I am going to agree with this. It was a little difficult to find one of the questions. Once you figure out that you can click on the building it was very easy to use and everything straightforward.

3. This website has appropriate use of color.

LD06: The color brings out the important tabs. It brings out the important numbers. It does a really good job with where to click on if you want to find answers or information.

4. The pages on this website are visually consistent.

LD06: I would strongly agree with that. Everything is set up the same way. With the modules and with the way everything is set up you know which ones have numbers. As you click between them, they flow very well. They look very similar.

5. In general, this website has a good balance between graphical and textual information.

LD06: For my personal preference this is very good. I am very graphically oriented and that is how I learn. I am going to one strongly agree with that. People who are textually involved might not like this. It is a lot of graphs. For simply getting the numbers it is very clear, very easy to read. Very little text...this is a good thing when you want to present data. I really like it.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

LD06: I agree with that if you click on different buildings they are all the same. If you select the building on the top or if you select comparisons they show the same graphs, the same data. Very straightforward, I am going to agree. There are, of course, more details under the comparisons than just clicking on the building. At least that was how I found it. I guess that could be improved. When you select a building more details could be provided on the top part where it shows the pictures of the buildings (by detail she means per-person comparisons etc.). When I say more details I mean the cost per-person or being able to select on a certain time because, if you selected a graphic, it is a little difficult to select a time period. Under the comparisons as compared to when you select a building on Map-Info.

7. Remembering where I am on this website is easy.

LD06: Very, very easy to find where you are when you place your cursor it turns white instead of red... very easy to do.

8. The organization of the menus or information on each page seems quite logical.

LD06: I am going to strongly agree with that. It is very straightforward to get to where you need to go. Everything you need is on the website, to get to most of the information. Specifically the links are very helpful as well.

9. Few mouse clicks are needed to find a given piece of information on this site.

LD06: I am going to say agree. The only reason why I do not strongly agree is because for the lake-source cooling question you had to go to a separate link and that was a little difficult to find. On this website, specifically, very few mouse clicks were needed... very straight forward on this specific dashboard. However once you get off of it, it can be more difficult to navigate. Because you have to enter Cornell's system and figure out how they organize everything.

10. I am engaged when using the website.

LD06: I strongly agree with that. The visual aids are great. Great. Very easy to read and understand. When you understand something you are more likely to follow it and be engaged.

III. Content

11. I understood the purpose of this website.

LD06: I think. My explanation, anyways... I personally took away... It is like when a book is written it is up to the people who read it to give it the interpretation not the actual website itself. So a website might be designed for a specific purpose but each person will use it in their own way. I understood the purpose from my point of view but it might be different from someone else's and it might be different from the intended purpose of this website.

12. The information I found meets my needs.

LD06: This is hard. You don't know because you don't know what your needs are. For right now for the needs I have I would say strongly agree. I found all the information that I need to and I did not have to skip any questions. It was very straightforward. Of course there's always the possibility that I will come across something that I need not held up by this website. As far as I understand it does meet my needs. This is perfect it has everything I need.

13. I felt information presented by this website is meant for a more technical audience.

LD06: I would actually disagree with that. I come from a statistics background. So graphs are something that I use a lot but these are very straightforward. They are graphs that are by the month they give money, or usage. You can tell bigger is bad and smaller is good in terms of energy consumption. Even though this might have more technical applications and use ideas that people might not necessarily understand, it is pretty straightforward in terms of visual needs (appeal). Yet this website is not meant for a more technical audience I disagree.

14. I find it was difficult to relate to the energy units presented.

LD06: I am going to disagree. He does use the technical energy units...which it should do because that is how things are measured. However, it does also provide CO₂ usage and money spent which everyone understands money. As I said earlier you know that biggest is bad and small is good for the kilowatt usage at least. Though it might be difficult to directly apply it... By providing the money and by providing the carbon dioxide units... by providing alternatives you can click on... it makes it more relevant and applicable and easy to understand. It gives a better understanding.

IV. Usefulness

15. I found this website useful.

LD06: I am going to say I agree. I guess the only reason I would not say strongly you agree is because I don't really care about energy consumption as much as I should. But, if I did, I would say strongly agree. If I were more concerned I would say strongly agree but I am not so I say agree.

16. I would use this website on a routine basis.

LD06: I would not actively search it out I would just poke around once in a while. I would not really use it on a routine basis. Only once a semester.

17. Identify one energy-conservation tip provided by this website:

LD06: That is very straight forward it is right on the commit to conserve page right on the homepage I am going to use the first one. It says use the desk lamp instead of an overhead light.

18. Please identify the feature of this website you found most useful:

LD06: The thing that I found most useful from the questions given was being able to select a building at the top. Because I was only looking at the Human Ecology Building it made the information a lot easier to access. Being able to choose a specific building was extremely helpful. And it's right at the top very easy to find. I wonder if you can look at all of Cornell at once.

19. Please identify the feature of this website you found least useful:

LD06: Perhaps it is a feature that is missing that would be a search bar. This would allow you to access other content. For being able to access other content in the Cornell University website again in the lake-source cooling question I had to go to a link outside of this website in order to find the information that I needed and wanted. Although the link is nice, I would maybe add a search Cornell box up at the top. If you want a feature that is already present, I don't think Twitter is useful. It is connected so I think if some people wanted to they could definitely use it but I say it's the least useful. I should also note that the weather underground had a security error so I don't really know what was going on. That is the last question.

END OF POST TEST INTERVIEW

Participant: LD07

Transcription: Task Analysis

START OF TASK ANALYSIS

Transcription:

LD07: So Cornell red, big time pretty cool. Definitely like the pictures of the buildings and the titles of them, especially if you're a grad student who's kind of new, that's really useful. So far looks pretty cool, there's a lot of gadgets on the front that I'm not 100% sure what they're uses are for, but I like the scrolling aspect that's pretty good. I like that there's not that much clutter on the side, and most of it's on the main focus. So I guess I'm gonna try this out, first question.

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

LD07: "Average hourly rate" (clicks around) all right this is a little confusing so far. So I like the graph option that's pretty cool, I like the different colors, it's just a little confusing, just that there are so many of them (line graphs under comparison-all buildings electricity, check box for building). Hmm, so far having no luck with the first question. Understand what the question asks, not 100% sure where to find it on here. (re-read instructions) Okay, now that I have a little more clarification, I'm not so lost, I'll look at the Human Ecology

Building. So “academic building” so looking for Human Ecology under “academic building electricity” and not finding it right away, which is a little weird. So I’m gonna try “all buildings electricity” hopefully find it there. So finding Martha Van Rensselaer, which I’m assuming is what they’re referring to, and right now I’m seeing that it has no data displayed. So, I hope that means it’s not the one I’m looking for. So far I really like the fact that it’s really quick to pull up a graph, when I click add a graph, that’s a really nice feature of it, scrolling’s pretty good. Text is pretty visible to read although there is a lot of them. And I found it, yay me! So adding that on, so that’s cool it definitely shows up big time. And so for today it looks like the highest consumption was at noon. I’ll put that down as 12 noon.

2. Today’s electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

LD07: Okay next question...

LD07: So I guess I’m going to compare today to yesterday “customize period” okay this is pretty cool. Yeah, starting at 12am, end date. Um, so not a huge fan that it won’t let me stay on the building I’m using to make the graph when adjust the dates. Hmm, I guess, make this the 24th again, and this at 11pm. Okay so instead of comparing, I’m doing one day and like mentally comparing the next day for HEB. So Human Ecology was about 466 and lets do it for the 25th now. Okay, so I’m gonna say, it’s a little weird because it’s not the entire day yet, so I’m gonna say has not changed since they’re basically pretty similar and the day isn’t over yet. But one second, do “accumulation” ... so it would be cool if I could graph on the different days of the same building on the chart and not have them in different colors not specifically by the date on the x-axis, that would be nice. And would say it is difficult to use the scroll with the mac keyboard just because it tends to move everything too much, but on a PC this would be nice.

3. Today’s maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

LD07: Okay, so cooling, this is pretty cool. So under the cooling it’s a little annoying that it’s all 40 buildings, I wish they would do it with a kind of a break down because this is kind of a pain to scroll through. Okay, so yeah, I really don’t like that when I switch up top that I lose whatever I was working on. Okay, scrolling again is not fun, I wish they would keep the one I was looking at the top. It gives me how much cooling chilled water tons for Human Ecology, but I’m not sure if I can break this down into money. There’s not a thing on it. So I’m looking under “sustainability” and that doesn’t seem to tell me anything. I’ll look under “competition,” “competition looks pretty cool. But back to the

“comparison” page, still trying to figure out how much this costs. All right so we’re just going to go with the 1702 that’s pretty much what it looks like it’s gonna tell me. And it really isn’t letting me know what kBTUs are, which for someone who is not familiar with this, is a little annoying. Okay, so I’m going to onto question 4.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

LD07: So I’m going to do “total” (clicks around) so it’s a little annoying that there’s not another way to click through all of these, but that might not be 100% what I have to do. And so it definitely looks like it’s April for the month.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

LD07: So question 5...

LD07: Okay so this is looking just for this month, it says heating. So we got to find Human Ecology Building. Okay, so it would be on the right or left if there was a little blurb that says exactly what I’m looking at. Just kind of telling me what kBTUs are, about the heating, not something large and obnoxious, but more, just some informational things. If I were to stumble upon this I would know what I’m looking at or what I was looking for. Okay, so this is pretty cool, so I made a graph, and it’s of April so far and it was really easy to do. And to find the highest, that’s pretty cool. It looks like it was April 2nd. Definitely like the purple color for the graph. It would be cool if there was an option to make the graph bigger, take up the whole screen, or to export the graph or something, it doesn’t really look like I can do that much with it right now.

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

LD07: Okay, so question 6...

LD07: So let me go “residential hall,” January 1st to April 1st. Bring this back to April 1st the date thing is pretty cool it’s easy to use, so we’re doing total “per person.” And so this is pretty nice under “dormitory” because you can view them, so that’s pretty cool. And so it looks like the highest would be Hans Beth Hall, and it would be 26.. kW/ person. This is really hard to read, the graph and especially when the numbers are written in yellow ink. It gets really hard to see, again it would be really nice to blow this up a little bit and on the graph it would be nice to have an automatic like “find the highest point” or not, but you can also do that visually through...(checks off more buildings) what’s going on. I don’t really need to use the graph on here. It has per person on here

(horizontal bar graph) which would be the Carl Becker house, which is kind of weird. All right so I'm going to redo that answer to go by what the yellow lines are saying. So that one didn't actually need the graph, but still.

7. Lake source cooling represents the following % reduction in energy use for campus cooling. _ %

Transcription:

LD07: So on to question 7...

LD07: Okay, no clue. So I'm going to go to homepage and see what's there. There like a cool comparison thing. I'm going to go to the "sustainability" factor. "Climate action plan" doesn't really help me at all. Oh, "lake source cooling," this is kind of cool, it tells you a little about it. It says it reduces it by 86%, that's pretty cool.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

LD07: I'm going to go to homepage. It's where I hope the mission would be. Um, okay so what I'm going to say is kind of based on what the little message on the homepage says, the mission of this website is to educate people on how Cornell is trying to reduce our environmental impact and be more sustainable towards the environment. Kind of reduce cost for heat and water, electricity. We'll write that now.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

LD07: All right question 9...

LD07: Um, so that's like tough. Just going through the buildings and everything, I don't feel a personal connection to that just because the buildings I'm in all the time, I might not be the one who has the lights on. Under the "sustainability" section, I don't see any personal tips, that would be another thing I would say, have a second section "what can you do to help Cornell" maybe on the side again. That offers some tips about turning off the lights in a room, or keeping the heat down, something like that that's a little more personal to the user, especially if they're using this more for information, not for a class for a specific goal, that would be really useful. Because I'm in it, but I'm not the one running the labs, so I feel like my impact on the building is not as bad. But to answer the question, I would have to say it makes me more aware of what I'm using in my building, like for heating and electricity.

LD07: Yeah, so overall the website is nice to use, the visuals are pretty good, I would say the text is a little small for things to look for and I feel like there needs to

be more options like how you can be more sustainable at Cornell and explain to me what some of the scientific numbers mean kWh, just explain what that means for me personally and bring it back to someone who hasn't taken a science class since high school. The "competition" is pretty cool, none of the questions covered that so far, it does tell me when it finished, but making this more accessible to the user, just easier to understand. The homepage, I liked the message of it. That helped a lot. But the thing up top with all the building pictures, I didn't use that a lot, it would probably be good if you wanted to figure out what was going on with the buildings, but just more basic information for the user would be nice.

END OF TASK ANALYSIS

Participant: LD07

Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

LD07: I like the color scheme they're very nice colors. The text is a little hard to read but I would say number two, agree with that.

2. The layout of this website is well organized.

LD07: I thought the headings were really good. When you when went on to competition page you got the competition. So I think that was useful. A little bit more information (would be useful) on each of the pages about what it was exactly that it was doing there. It kind of just launches you into the webpage so that was a little confusing not knowing exactly what I was looking for... So I am going to say to four well organized.

3. This website has appropriate use of color.

LD07: I like the color ... I don't I like the fact that... So it is tough, the fact that this is Cornell and it is red... but when I think of sustainability or energy I think of (the color) green so it is kind of a Catch-22 there. I think having the headers in red is nice but I might not, I am not a huge fan of the yellow because it's a little hard to read but I feel like for electricity it make sense. Maybe having electricity be... I don't know, it is tough because electricity is yellow, heating is red and cooling is blue so I'm going to say a two for appropriate use of color... because again Cornell is red.

4. The pages on this website are visually consistent.

LD07: I would say yes it definitely feels like the same person had their hand in making all of this so I am going to say one strongly agree.

5. In general, this website has a good balance between graphical and textual information.

LD07: I am going to have to disagree with that because there are words... It tells me buildings but especially on pages like the comparisons I don't have all the information it is just agree and clicking and hoping that I know exactly what I am talking about. So I am going to say disagree for that.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

LD07: So I am going to say I agree with that. Pretty much, especially for comparisons cooling versus heating. I basically knew what I was supposed to do. How it could be improved would be like adding in information about what cooling is, heating and electricity... How it is measured exactly? Just some more information that doesn't have to be on the page could be on the sites would be really useful.

7. Remembering where I am on this website is easy.

LD07: The organization... Yeah I would say agree with that. I mean it is alphabetically done after the homepage, so that makes sense.

8. The organization of the menus or information on each page seems quite logical.

LD07: The homepage seems logical. I mean yeah. It made sense to me how it was being used. And on some of the pages you can alphabetize or do by decreasing or increasing order. So I am going to have to go with one. I strongly agree with that.

9. Few mouse clicks are needed to find a given piece of information on this site.

LD07: I needed few mouse must clicks to find a given piece of information on this site. For me, personally, I am going to say disagree just because there is a lot of scrolling and clicking for me. But that just might be my user thing... But I feel

like any user who is not 100% sure on what these are measuring or what these are for would have to do a lot of clicking especially when there are a lot of buildings to choose from. When there are 4449 buildings together it is just a little too much scrolling. I would say strongly agree, it is definitely not something that I do while I am you-tubing or something.

10. I am engaged when using the website.

III. Content

11. I understood the purpose of this website.

LD07: I understand the purpose but I didn't really know how the comparison and everything helped me other than looking at the building. It didn't help me as a Cornell student so I am going to agree.

12. The information I found meets my needs.

LD07: I am going to say strongly disagree. Just because kind of what I had harped on already. I am in a building where a bunch of people are running huge scientific experiments so I do not feel like me keeping my laptop plugged in or something is actually contributing that much. So (it contributes to) being able to have more information... I'm actually on the homepage right now and it has a commit to conserve and it has some useful tips which is cool but I totally glazed over that. So this might be something to highlight a little better just something that makes it a little bit more personal to the person using that I think would help.

13. I felt information presented by this website is meant for a more technical audience.

LD07: I felt the information presented by this website... One I would strongly agree. I am very intelligent but this is not my area of expertise and I had a hard time navigating exactly what I was looking at, exactly what it was measured in. So I would say it feels kind of like I am not supposed to be here like it is for a specific class for a specific audience.

14. I find it was difficult to relate to the energy units presented.

LD07: I would say agree, two, because when you could do it by per-person that needed a little bit more relatable but still it is like, am I that average person?

IV. Usefulness

15. I found this website useful.

LD07: I am going to agree with that. It was interesting to see where the buildings lined up. And how one goes to the other but it is just a little weird because each building has different purposes so you kind of account for that already.

16. I would use this website on a routine basis.

LD07: I would probably say five, never. Sustainability isn't really a big thing for me so I would not be highly involved in in this website or anything.

17. Identify one energy-conservation tip provided by this website:

LD07: Identify one energy conservation tip provided by this website.

18. Please identify the feature of this website you found most useful:

LD07: I like the sustainability part it was kind of interesting to see pictures and stories of what was actually happening because I am looking at the commit to conserve thing it says is a death left instead of an overhead left. I think that you could increase the number of people coming to this site if you had a tab that said how to be more sustainable or how to And for you personally that was not just a little widget on the homepage but back to question

19. Please identify the feature of this website you found least useful:

LD07: I guess for me it was probably the competition page or like the top page really with all the buildings on it. I guess because I never used it and it never really changed from tab to tab so it was superfluous for me. And that is it.

END OF POST TEST INTERVIEW

Participant: LD08

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

LD08: All right so I'm going to go looking for the Human Ecology Building and it seems I have a row of buildings right here at the top and I'm just going to scroll over until I find the Human Ecology Building. Here we go, and I'm going to open that up. It's loading, the scrolling interface seems pretty easy to use and it was right there in the front which made it easy to access, easy to identify what I wanted. So right up front it comes up with a data sheet that I can scroll my cursor over and it seems that the highest peak, oh and this is a nice feature right here, whenever I scroll my cursor over, it'll go to the top measurement of, I'm not sure what unit is. On the y-axis it doesn't have units. Okay, so on the far right I can measure in kW, carbon dioxide, and dollar value. Okay so that was a little confusing at first, but let's see. So for kW the highest consumption so far today was at 1:30pm. And oh okay, I see, so on the right it shows me a meter of how many kW that is, initially I was looking for immediate identification of kW on the y-axis instead of looking to the right. So it seems to look nice, and this is a nice feature on the right that shows me the

different levels, but it might be easier if it was on the left next to the y-axis 'cause that's immediately where I tend to look when looking for a y-axis variable.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

LD08: All right I'm going to move on to question 2

LD08: I see there's an option to move this to "week, month and year" pretty quickly, I like how that's when I need to figure out more options, I can just move down the page instead of having to look on either side, it's immediately right there. So I have to answer if it's increased, not changed, or decreased. And today is Thursday, and it seems like energy consumption has decreased, and I can tell so easily from the bar graph. We've gone from 5,223 kW to 4, 000, which seems a little surprising to me because it was a little warmer, but you know, I'm no engineer so. So today's energy consumption has decreased, yeah, there we go.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

LD08: So I'm going to move on to question 3...

LD08: All right so I'm looking for "cooling" in chilled water tons equivalent. So I'm looking over here on the right back to the units and I'm scrolling through the C CO₂ and the dollars worth, and I don't seem to be finding a "chilled water tons unit" maximum demand for cooling. All right I'm going to move down the page then, oh no back up at the top of the page I see there's three options "electricity, heating, cooling." And I'm going to go to the "cooling" units and ask for the maximum demand for cooling. And I see 2 bars that are very similar one at 6am one at 9am. And scrolling over them, I see they are equivalent to 192 kBTUs and 192 kBTUs. I like how this one gives me the actual value on the y-axis in the little pop up comment box, nice blue pop up comment box that was not shown in the other graph for electricity. At least I didn't see it immediately. So this is 192 kBTUs at the time doesn't matter, so 192 kBTUs.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

LD08: All right so 4...

LD08: Alright well I've gone through temporal thing at the bottom, so I'm going to switch over to "year." And it's asking me for the month of the year, so I have the right units. Right now I see they're only 2 units. I'm assuming this is a new interface, which is why they're doing studies on it, so the highest demand for cooling happened in chilled water tons... I'm going to go back to the top, I see it's in "cooling," but I'm not sure I see "chilled water tons." The unit I see is kBTUs and I'm not certain if I have this right or not. So I'm gonna look around and see if I can find a unit similar to chilled water tons. So I'm going to scroll the top, go back to electricity that was in kW, heating was in kBTUs, cooling was in kBTUs. Gonna go back to the right here, I see dollars here and kBTUs, so that's not right. The tabs here "homepage, comparisons, competition, and sustainability." I'm gonna go to "comparisons to see what I can find there. It seems to show me different houses around, or different buildings the first ones that show up are residence halls, and I see on the left here there's a "cooling" thing, which I'm going to press on. And let's see if I can find the Human Ecology Building. So I'm going to scroll down, continue to scroll down, and these units seem to also be in kBTUs so I'm starting to think that this "chilled water" unit is also kBTUs but only under the "cooling" tab at the top. So I'm going to go back at the top, go to the year, stick with the "cooling" unit and I'm gonna go with this unit right here. Of the two that they show, March and April, it seems that March has a higher demand for cooling, so I'm going to put down March.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

LD08: All right so number 5...

LD08: Um, all right so I see "heating," I see demand for steamed water, so I'm going to go into the middle tab right here that says "heating." It seems to be the same unit kBTUs, when I looked at the question it asked for steamed water in MMBtu/hr, and this is showing me total BTUs, so I gotta find some sort of rate unit on here. Okay, I'm looking back at the graph and I'm gonna click on the graph and nothing comes up. So I'm looking back on the right here, this little indicator that shifts interestingly enough, I don't think that I noticed the movement of the numbers before. Maybe it's because I'm used to having pop-ups on my e-mail, I think it's something on the screen that I usually phase out. If the purpose was to catch people's attention with the movement, I would already have to be looking at it pretty closely at it to notice it. Otherwise it just seems like a pop-up that you want to ignore, or at least I do. Okay, back to the question... okay so I have to go back to "month." That seems to be what the question is asking and I am in it seems like we're in this month because the last unit was the 25th, okay so we're in this month, in the right place, I'm in the steamed water area and it's asking for which day of the month was it consumed the highest. And I see right here at the top, day 2 and day 3 are

almost exactly the same, I gotta look close at the difference here. I can see the general amount, 32,000 kBTU, but I have to discern really close to tell the hundreds and tens place for this graph. And it seems with quick comparison, the third of the month seems to have 30 more kBTUs, so I'm gonna stick with the answer, May 5th is the highest consumption for heating. And it was asking me for steamed heating in unit per hour, and I don't see a unit per hour, maybe if I click on these scrolling numbers on the right side with this coal graphic, it increases or decreases depending on the amount you're looking at. I don't see any rates, and I can't remember, I'm pretty sure kBTUs are solid, are not a rate of electricity flow, but a total amount of electricity, so I am going to stick with my answer here. I'll probably get it wrong, and actually I looked up at this "layers" thing because I was looking for a rate unit, and it says options "show forecast, show previous month, and show outdoor temperature." So it looks like I can compare "outdoor temperature" or "months" just as a way for me to, for someone looking at this website to see how the weather affects the heating or cooling demand, which could be interesting. I would definitely want to do that if I was looking for information on this website, or trying to get some sort of sense how the weather affects different buildings, whether it affects efficiency, insulation, I'm not sure. So far I'm not entirely sure what the purpose of this website is, it seems to be an informational, a comparative way that people can get, so they can know how much their building, especially people involved in KYOTO now, I have a few friends in that and they seem to be very concerned with greenhouse gas emissions, and electricity consumption is obviously a big one. On west campus, and on north campus I remember several initiatives to try to get different houses to compete for energy consumption so this seems, so far, it will be pretty useful if you wanted to be aware of how much energy you're using. It might fit in better with, now that I'm thinking of the bigger implications, it might fit well with having to cut down carbon emissions by whatever date the University has decided to do that, and of course the whole divestment from fossil fuels. Just a big push. It seems like this homepage was created for something like that.

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

LD08: Anyway, I'm going to move on to question 6...

LD08: All right so I already looked at these tabs, the ones right below the graph, that have "homepage, comparisons, competition, sustainability." And I see I'm going to look into residential dormitory use, well that's the first option here, so I'm going to go right to residential hall electricity. It says there's 6 buildings involve with this. Carl Becker, actually it has the highest, and then Hans... So the map here (at the top), it seems even by clicking "residence hall electricity" I'm still in, the bar graph up here for heating units, is still under the Human Ecology Building, so I need to find a measure of electricity in kW/ person. So

either they already have kW/person, or I have to find total kW and divide it by the number of people, so I see immediately above the bright yellow bars, the month, and right now it seems to range from February to April, I guess it's the last 3 months, that's the standard feature there. So what I want to do is look from January 1st to April 1st so I'm gonna shift, I'm gonna click on this blue bar and it seems not to be working. So there are arrows on each side of the blue bar that I can, oh, that allowed me to extend it each way. Okay, so I thought initially that the time range was set but it seems pretty quickly and pretty easily to manage what dates to set it on. So I'm gonna go, it's not too hard to scroll over, the dates are kind of small, but I think that's better for them. In that I want to move them over once and not have to look at them later. So I've set it from January 1st to April and I need to see how much electricity in kW/person. I found the highest energy consuming dormitory, which happens to be Carl Becker, and I'm clicking on the bar here, and no, okay so I'm going to add it to the graph. I assumed that clicking on the big yellow bar that had Carl Becker House would immediately bring it up to graph, but in smaller text to the left, it says "add graph," and there's a button. It was not my first instinct to click on that button, or read the small text. I've clicked on the button, and I can click it on or off again. When I clicked it, it's gotten rid of the text and it was a green check mark, I don't see any changes immediately. Okay so I was looking back at the graph at the top and expecting that to change when I click on these bottom, the Carl Becker house, but I guess I have to go elsewhere to find the total. Electricity per person, so it tells me the total amount for that period, so 660,000 approximately. And I guess my first instinct was to go to these grey icons on the upper right, and it seems that I can choose the exact unit that I want "per person." All right, so that's quickly transformed Carl Becker house, the number on the bar to 1,766 kW/person, and I think that is exactly what the question is asking.

7. Lake source cooling represents the following % reduction in energy use for campus cooling. _ %

Transcription:

LD08: Number 7 says...

LD08: All right so different question I have to look at the campus as a whole in its electricity use. I'm gonna immediately look back to the left tabs that say "residential hall electricity, academic building electricity, electricity, heating, cooling" that was my first instinct. And "academic building electricity" it doesn't seem to have anything. Possibly "electricity" itself for all of Cornell, but as I clicked on it, it seems not to offer me any different options, it's all the same houses and residence halls. And there's a pop up that says "items with no occupancy data have ..." it went away really quickly, so I couldn't exactly read it. So it says "items with no occupancy data have been hidden." Okay so this is the only data we've collected (refers to residence hall charts w/ kWh/person) But electricity I can't see how much it differs from electric residential

hall, they don't seem to differ. I guess I'll just expand on this. I can't find it immediately. I guess I'm going to keep on scrolling down to "heating," but I guess that breaks all these buildings into heating. So I'm gonna go back to these middle tabs that say "homepage, comparisons, competition, and sustainability." So I'm gonna go back to the homepage and see what it has to offer. And I am trying to scroll down, but I can neither press down on the keyboard and the scrolling bar on this website. So I'm reading what it says on the homepage. 80,000 square foot building. There's a typo here, it says "buildinf" instead of "building"... provides high tech research ...multi-purpose classrooms" all right I don't think that's what I want. There's an option that says "close the message window" so I'm gonna close that and see what comes up. All right so I have options here "commit to conserve" "building comparison" and I see there are 2 more, at least 2 more that say "discussion and budget."

LD08: But for some reason I can't find the scrolling bar. Okay well I don't want "building comparison," that's where I was before. "Commit to conserve" it seems that this is an activity that you can do, just looking at these descriptions super quick, I don't want to get into that right now, so I'm gonna go back to the top. Gonna click on "sustainability" maybe this time (on competition page). Okay so this is again the theme of competition, seems like eco house is doing well, good job guys. So this isn't all of Cornell. Having trouble focusing, oh that was "competition" my bad. I'm gonna go over to "sustainability" and this seems to be different initiatives and pictures. That's not what I want, I'm gonna go back to the top and click on "campus sustainable Cornell." Back to the beginning before I selected the Human Ecology Building, I'm gonna hope this is going to give me a general Cornell campus wide indication. All right, I'm starting to think there is no overall Cornell campus wide information source. I would have thought that if they have all of these individual buildings, they would have a Cornell wide energy use, but I'm unable to get there. Once again I can't find how to scroll down, so I'm going to go all the way to the end of these buildings and it doesn't seem like there's a Cornell wide thing. Well I'm just going to move on, I'm going to skip number 7.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

LD08: Okay so for number 8...

LD08: So I have a little bit of bias, it seems on North campus and West campus from my experience energy use has been a big initiative. Especially measuring it and comparing it and competing against other buildings for saving energy and reducing carbon emissions and such. So I'm gonna say that the mission of this website is to provide easy and reliable access to the Cornell, or Ithaca community because once again I think that this poses a lot of these issues in a

competitive manner, so it's aimed more towards the community of Cornell instead of a larger geographical region, maybe between colleges. So I'm gonna say that it's to provide easy and reliable access to information related to electricity use for the Cornell community. And I don't know if they specifically write down their mission statement (on homepage, but previously closed window with text). It's not on the top, it's not on the side anywhere. I like that the sides aren't cluttered, but I would expect something that important to be on the sides. And once again I can't get to "commit to conserve" and the "building comparison" in the homepage, there's no way that I can find the scroll down, so I'm just gonna assume that there is no mission statement on here. So provide easy and reliable information related to electricity use for Cornell community. And I guess the goal of this information is to specify specific areas of improvement. It seemed that way because there was a lot of comparison between "heating" and "cooling." Comparing outside temperature versus outside. If someone was logging on and wanted to see which building was the most insulated for example, or which building lacks a lot of insulation, maybe that would be what someone was looking for if they wanted to specifically put in the effort to improve that efficiency rate. So the focus of this website is in its ability to give comparative information to those looking for areas of improvement.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

LD08: Number 9....

LD08: Well that's gonna be tricky to get me to conserve energy. I guess I will try to find an answer for that. Well it could help me if I decide if I'm in a big enough competitive mood, then I might look up my house, my West campus house, and see how it compares. I personally don't have much house pride, but I know they have large efforts for people who do want to be really active for the West campus or North campus housing. I guess this provides easy and reliable information especially when compared to other houses. And I'm back in the "comparisons" area and I'm gonna go to "all buildings heating" and "all buildings cooling" and check these guys out really quick. So I roll down, heating is red, cooling is blue, I like the colors, they're representative of the things you're trying to get across obviously heating is red, electricity is yellow, cooling is blue. When I click on the "all buildings cooling" there seems to be an issue with the blue bars after the first 2. Baker lab and Appel Commons both have large blue bars and their values are 7 billion, approximately kBTUs and the Cornell store is only 49 million, and I guess that makes sense that there wouldn't be a blue bar under that. It may make it easier if accurate, but it makes it seem like there's an issue, who when they see all these large, very specific numbers, tend to scroll over them. I'm having trouble, I feel like there are there should be something on this website that gives me some sort of

initiative, and now I remember from before. Something on the homepage, okay yeah, here we go, I'm on the homepage and I see the "commit to conserve" icons and it seems to give me several easy suggestions, I'm just going to use the first one. So "use a desk lamp instead of an overhead light", and I personally like using my desk light anyway. Sometimes my roommates use their overhead light instead of desk lamp, so depending on who you are that would be a good suggestion. So I'm just gonna go with that.

LD08: And the only reason I could get back to that pretty easily is because I noticed it briefly before, it does have a nice bright orange thing that catches my eye in the homepage, but if I was looking specifically for suggestions, I might try the red tabs. The "homepage, comparisons, competition, and sustainability" my initial thoughts are that it would be in the "sustainability" tab, but I did remember the "commit to conserve" thing in the homepage.

END OF TASK ANALYSIS

Participant: LD08
Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

LD08: I would agree, nice graphics they use all the best pictures for the houses. Simple but seems professional so I am going to go with strongly agree.

2. The layout of this website is well organized.

LD08: Yes. There is a lot of information on here. And I assume that it is hard to organize it in a way that... like I was saying it is hard to put all of this information on here but I assume that anyone coming on here is already going to want to find specific information. It seems easy to get around and once you've discovered a new area of the website is easy to get back to that area. So I'm going to go with agree, not strongly agree just because there is so much information.

3. This website has appropriate use of color.

LD08: I would say yes agree, like I said before, when I was looking at heating, cooling, and electricity, simple, colors, you know red blue and yellow worked very well. The red tabs are nice because they stand out and let you know click on one of these, these are going to be your main access to different areas of the webpage. I mentioned this before as well, but the orange commit to concert tab grabs my attention without overpowering anything else. It is a good way to get me to look at it and (it) get(s) me interested in the ways I can conserve. Strongly agree.

4. The pages on this website are visually consistent.

LD08: All right so I'm going to flip through these red tabs. Homepage, comparisons, competition, sustainability. The question was: Is it visually consistent? It is taking a little while to load here. It seems to be, for the most part, pretty similar. All the bars for comparisons and competition they're all pretty similar they are in the center, they are in the front. It seems to be pretty consistent throughout. Agree.

5. In general, this website has a good balance between graphical and textual information.

LD08: I suppose that would just be data. It gives me a lot of numbers and a lot of access to those numbers and I feel like the interfaces are easy enough to use without being overwhelming. Like I said before, the numbers, when they are so high... Like I saw a 7,000,000,000 kBTU number but it was a very specific one, which specificity is good. But when I look at this, I am immediately just looking at comparison. I am not sure how to resolve that issue, but overall I would say it gives me access to a lot of information. Without too much overwhelming visual stimulation, I guess. Some of the times it did but not all of the time so I would say I agree. It is in general a good balance between graphical and textual information

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

LD08: So organization it's pretty consistent across the different pages. I mean like I was saying before, all of these big comparative bars are in the middle with comparison and competition... And in the outer tabs... homepage and sustainability in the outer tabs they seem to have a lot more pictures. It is a little bit busy, but it is just pictures and segmented areas. Has more of a Facebook and social media type of interface and informational source than the middle two. Strongly agree.

LD08: How can it be improved? Like was saying before when you click on homepage, and you see this commit to conserve thing...maybe there are ways in which you can put other initiatives, news boards, music awards or initiatives along the side... along either the left or the right side and maybe also the mission as well. If there is a mission on this website that I cannot find so far. Maybe something like that would be good. At the same time it seems to be a very visually stable interface, which is good because I generally try to ignore moving things. I am just going to put down easy.

LD08: I am clicking back and forth between these tabs: homepage, comparisons, competition sustainability and I don't see an easy way of organizing that area. I'm going to go back up to the campus life, Alice Cook House. How can the various organization functions be improved? I guess just the picture of this power line with the kilowatts. The information about the Y-axis, maybe that should be pulled over to the left because that is a quick reference point. Or even better yet, I liked it when I clicked on the chilled water or heating... when I scrolled over the specific bars a pop-up showed the exact value for that bar on the Y-axis. So I'm going to suggest that the electricity, graph B..oh no, you are right they do have the units. I guess I'm stumped.

7. Remembering where I am on this website is easy.

LD08: It is easy I would say there are two main sections: the upper part was specific to the houses and in the lower part. I had no trouble moving between one and the other. It wasn't asked if when I clicked something on the bottom part it open something on the top part. It was separate. It was easy. Strongly agree.

8. The organization of the menus or information on each page seems quite logical.

LD08: Logical. Yeah I mean I think so. It makes sense that the specific house information is right here at the top. It is small enough to not get in the way of all the information below it (points at the top half of the page)... But if you are only looking for the specific information it is easy to access, it is very detailed and it is a cool little thing that you can play with. Strongly agree.

9. Few mouse clicks are needed to find a given piece of information on this site.

LD08: This is the first time I had been on here. So I am not sure how it differs between someone who has been on here for a while as compared to someone who hasn't. I imagine if you have been on here more often it would take fewer clicks because you would know exactly where to go and it is not like there are many things, inside of things, inside of things. It is all laid out pretty much on the surface. So I'm going to agree. As a person who is using this for the first time I did not have to click on many different things for the most part. There were a few things that were a bit confusing...as I mentioned earlier... and you can take your time and piece that out. I'm going to go with agree with that one.

10. I am engaged when using the website.

LD08: I think so, very much so. The top electricity chilled water and heating energy count; like I said before it is easy to use it is compact, it is very interactive. And that is something I'd like to do, something I would like to fool around with for a little while. Also the function at the top in comparisons and competition, I like how you can choose the dates. Any dates whatsoever and it will change continuously as you slide over the dates, as you change the unit, and so on. So I am going to go with strongly agree.

III. Content

11. I understood the purpose of this website.

LD08: I understand the purpose of this website. It seems pretty, pretty obvious to me. So I'm going to say strongly agree. It asks me to explain. I'm going to say that this is a tool for anyone interested about knowing their energy use and ways of improving on it. Although this isn't a very personal thing, it only gets to the different communities...whether it be a specific house. Mostly specific houses actually or specific buildings. I don't think there is anything where I can specifically calculate my use. But in general, that would be obviously a much harder thing to do and if people want to have an impact on the community anyway, the suggestions that are shown on this website are a good way to get people started.

12. The information I found meets my needs.

LD08: Meets my needs...So my needs would be I guess to know what I can do. I honestly could care less how much the average person in my dorm is using...Because I am not aware of what practices they have for energy. I am only aware of what I use. There is no way of indicating whether my specific use... This website does not allow me to see if I turn off all the lights when we go to sleep or if we unplug our fridges or various other things. How that affects the building or the community as a whole or any way of measuring that. My only need that I can fulfill from this website is to find specific ways of contributing. Which I guess is the main purpose of the website anyway. So I am just going to say that. Agree. This website allows me to find specific ways of improving energy use in my house and situation.

13. I felt information presented by this website is meant for a more technical audience.

LD08: I disagree with that. I would say that the BTU units and the kilowatts are pretty standard throughout the thing. Those were the only scientific units that I can find. I don't think. I think that the average college kid knows what they are. If they don't, they can pretty easily look those up. If they have energy interests by going to this website in the first place, they are going to know what unit electricity is in. Question 14. I would disagree with that statement... anyone interested in energy should already know their units for electricity. And the only other units I saw were BTU's per person. And I'd say those are pretty easy to understand as well.

14. I find it was difficult to relate to the energy units presented.

LD08: Neutral. I am not really going to be one to use this website at all because I would not be interested in seeing what people in my dorm use for electricity and I have no relative way of finding out how much (energy) is used for a specific practice such as leaving the fridge on.

IV. Usefulness

15. I found this website useful.

LD08: It is hard to relate these numbers practical life. It is useful for competition. Like I said there's no comparison to real life.

16. I would use this website on a routine basis.

LD08: Honestly, once a semester if I had a reason to begin with. If there was some initiative or project that is involved with that would give me a reason to use this. Other than that I would have no personal reason to use this. Just as an interested student.

17. Identify one energy-conservation tip provided by this website:

LD08: Turn off the light. Or I should say rather... the tip was to use desk lamps instead of overhead lamps. I could easily get back to that by clicking on the homepage and the commit to conserve is right there. I can't scroll down that was one of the issues I mentioned before.

18. Please identify the feature of this website you found most useful:

LD08: The commit to conserve thing. Because I can see those numbers it is a cool thing to do. But I have no way of relating it to my practical life. It is a lot of data and for me and right now I have no use for it.

19. Please identify the feature of this website you found least useful:

LD08: Feature. Actually I didn't notice this before but I'm up at the top and looking at electricity, chilled water and heating. Now I'm under Alice Cook. And go back

to the Human Ecology Building. And I see this other feature here that I can see the units of electricity. But I can also see it in carbon dioxide emissions and dollars. Wow that makes it a little bit more real but I don't really pay for electricity in this building, so I really don't care. So those could be useful. I personally am not using that right now but they can be useful. Back at the top I didn't notice this search function for buildings and Cornell Campus just overall was just in the buildings search function. Oh no wait it just brings me back to the options for the houses. I guess the search function I don't find very useful. Everything else here is easy enough to navigate. I guess I'm just not using the search bar. I guess that is it.

END OF POST TEST INTERVIEW

APPENDIX D: ALERTON DASHBOARD TRANSCRIPTIONS

Participant: AD01

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

AD01: So I'm looking at the front page of the Human Ecology Building Dashboard as the title says and I'm guessing you hit next on the little slideshow. I guess that's just pictures. Learn more then. Lets see, it says building details, campus energy production ... and that pop-up is locked. It has all the cute little things at the bottom that would have been helpful to notice. So today it says energy consumption. It is the one that says energy. So today somewhere around 8pm energy consumption was the highest but I guess, I wonder if that's in MMBtu, I wonder how you would get that to kilowatts and if you wanted kilowatts per hour. So the units don't really change much.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

AD01: So moving on to question two...

AD01: Compared to yesterday that would... Yesterday's day would be the 21st. Click on 21st. Let's see yesterday, select, hourly or I guess daily. So now that I've clicked on daily it looks like today's energy consumption has decreased.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

AD01: Okay. So cooling at the bottom. So today's maximum demand and having that in dollars. Not quite sure where that would be on this page. I guess the dollars part of it is not as obvious as the in-tons part. Lets try report. That doesn't look like that would be it either, so back to cooling. So yeah, I guess that question I can't really find the answer to so lets move on.

4. Which month of the year presented the highest demand for cooling (chilled water tons)?

Transcription:

AD01: This year, that gives us for 2013. So it looks like April then...so yeah then 277 tons.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

AD01: Moving on to question 5. So clicking on heating. So it is very convenient.. the day of this month that has been highest is April 2nd. I do like the percentage as

to how it compares to other months. The big green arrow is definitely aesthetically pleasing and brings the point across.

6. The following are unique energy conservation features present in the Human Ecology Building:

Circle all that apply:

daylight harvesting,	reflective roofing	habitat restoration	supervised indoor air quality	lake source cooling
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Transcription:

AD01: Moving onto question six...

AD01: Maybe under compare or probably facts and definitions. It probably gives you a better sense. This page looks a little weird because it has a part for videos with no videos on it. So that doesn't look quite as correct as it should. So it had all of those and it was nice that they were green and bolded. This graphic looks a little weird with the graphic going across the book pages. It doesn't look quite as realistic if the graphic were completely on its page.

7. Second floor plug load energy consumption was lowest at what time today?_ AM/ PM

Transcription:

AD01: So second floor plug-load... the consumption was lowest at what time today? View chart. So yeah. So just visually on this graph it looks like 1 am was the lowest but maybe just with the graphic it makes me think that 1 am is maybe faulty data but 1 am was the lowest. This layout seems a bit weird with the red and the blue it doesn't quite make sense with what it is asking... it seems a bit harsh with the colors. I like how you can click between the different levels on this page as opposed to going back and it seems that would be helpful for using it.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

AD01: Moving onto question eight...

AD01: It looks like the overall mission is to advertise and have people who are interested in finding out how much energy was used in any specific building, in this case the Human Ecology Building... and it definitely show cases which areas are working and which areas are not. Because you can see very easily on the cooling page... they had the compared to yesterday part and they have all the different places where you could use outside air temperature. So it seems like the mission of the website is to give as much accurate information as possible. It also has some other features at the bottom...like the facts and definitions, which I feel are more basic things and (they are) better suited to be

highlighted (on the homepage) because that is the overall general data. The homepage was a little bit misleading because it takes the focus away from the important features at the bottom. So maybe having an arrow pointing at the bottom or having these features be a bit bigger and more prominent would make a little more sense.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

AD01: I'm moving on to question 9...

AD01: It definitely shows the different uses, like the different types of ways that energy can be conserved just in the main bottom icons, with the current demand energy electrical cooling that kind of thing. So it at least shows what needs to be conserved more. I'm not sure with who is using this website how much control they have over the cooling of chilled water and the heating of steam but maybe with electrical energy they can turn lights off and stuff like that. Um. I think that is what that is kind of getting at. Ok.

END OF TASK ANALYSIS

Participant: AD01

Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

AD01: It's not the most attractive, definitely the icons at the bottom were kind of cute, and those helped understand and they have use as well as they're attractive. But the layouts of the pages seemed untogether, and the colors just didn't quite go together. So I would say neutral, but definitely on the side of agree of attractiveness.

2. The layout of the website is well organized.

AD01: I think that having the graphs in the center and having the choices on the left side seems very intuitive and easy to use. Maybe for everyday usage wouldn't care about the units, but definitely answering the questionnaire, having units tucked in the corner definitely wasn't the most helpful. Everything generally seems to be where you would expect it to be, so that would definitely help with everyday usage.

I01: Can you explain what you mean by the units weren't as important for everyday use?

AD01: So, like the units, I would probably want to see how much they compare to other times of the day, instead of specifically in the metric system and kW. To me that doesn't translate well into actual data.

I01: Okay, I see. Overall how does it compare? How can I make sense of this information?

AD01: Yeah, if someone would have told me "at 1pm the maximum demand for the entire building was 257 kW, that means nothing to me.

I01: What do you think are some ways that could be made more could be more conveyed more easily.

AD01: Maybe if it was translated to "oh, that's like leaving the lights on for a couple of hours" I know there was the question about the money that I personally couldn't find on here, maybe having that more obvious, that would definitely help to put it in real world terms. As opposed to oh okay its 257, that looks like its more than at 7. That means oh, we're using more than at 7. To me that thing I can read from the graph of it.

I01: And then, as you critique can you say which of the sections you found more section than others, is there one over another than you find useful?

AD01: I thought the facts and definitions part where it had the overall what the building is used for was definitely useful. You probably only need to see that

one once. The total energy definitely gives a more broad scope of the overall building usage. I feel that if I was, if personally, I felt “oh I need to do something about it,” definitely the electricity and water usage would be the ones that I would look at because those would be the things that I would see myself control like... oh turn the lights off, not leaving the water on when I’m washing my hands. That kind of thing. The cooling of chilled water and the heating system don’t seem as relevant because it seems like it’s not something I can control. I probably wouldn’t view those parts of the website as much.

3. This website has appropriate use of color.

AD01: I mean, its all kind of red, which is great for Cornell, but maybe put some more use of color. This page has a picture in the corner; pulling some colors from that picture to tie everything together would probably be better. But just kind of neutral on these colors.

4. The pages on the website are visually consistent.

AD01: Uh, yea, generally I think the main pages have good charts in the center, so I think, I didn’t click on that page (current demand). But generally, energy to water were consistent. Some of the icons at the bottom have different layouts, so maybe having them in a different bar to signify them, maybe emphasizing those because I know that facts and definitions was more basic, and it’s definitely a different layout, so having that either be the same with the graphs, or someway to have it clue in the person using the website, that it is different

I01: What you are gonna get...

AD01: Yeah, would be probably very useful. So I would disagree just on the fact that the icons at the bottom convey that “oh all the pages are going to be basically the same” but in reality they aren’t.

5. In general, it’s a good balance between graphical and textual information.

AD01: I guess, since most of the pages, graphs is their main focus, having those be the biggest part is very helpful. I guess text isn’t really required I think for most of these pages, it maybe, if I were to click on one of these and have it describe what it means, maybe having more text there would be better. Personally I like graphs, they translate a little better to me than just box of text, so while there’s more graphs, I think it suits what the purpose is. I would agree with that.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

AD01: As I said before, the bottom little icons suggest that the pages will be the same, but not really into have sort of clue that they would be different. I guess you kind of know by the titles of them that maybe a little more emphasis on that,

that would help you navigate across the pages and stuff, so I would say disagree. And to improve, emphasize differences in pages.

7. Remembering where I am on this website is easy.

AD01: It has the titles at the top, so I guess if I were really confused at where I was, that would be a big clue in, I don't know if maybe exploring it more you would get a little more lost, I know on the floor plan page it definitely had a pop up, maybe you can get a little confused with that. But to me that seemed a little intuitive to be able to close that out and go back especially with the bar across the bottom, o that was behind a level, it made sense we're in a different window at that point, so I would agree that remember where you are is pretty easy.

8. The organization of the menu on each page is quite logical.

AD01: Yeah, so I think that, the menus on the left is very standard, and having the graphs in the middle makes sense. Like I said, the units on the bottom right isn't super helpful, maybe on the graph would seem to translate a little better. Where someone would look if they wanted to change the units. I think putting them out of the way was a little bit hard to find, I don't think I would have found them if I wasn't looking to change the units. So I would agree with a few different qualities of that.

9. Few mouse clicks are needed to find a given piece of information on this site.

AD01: Yes, once I realized about the bar graphs at the bottom, which right now seems a little funny because that's the main navigation tool, but from the homepage it's definitely harder to find. It wasn't as prominent. Once I found that, it was definitely just a few clicks away for each of the information.

I01: So had you explored this on your own, do you think you would have liked it? If you were told about this website and when you go in, you can't find the bottom, do you think there would have been a point where you left?

AD01: I definitely think so, if someone had told me "oh they have all of these graphs, and floor plans" if they were talking about different features within this, I definitely would have kept looking for it. Probably would have found it pretty easily, but the fact that if I was just "oh, there's this energy dashboard, go check it out." I would have probably looked at the first page and been like "uh, dashboard? Oh okay" and then probably have left. But if I had some clue as to what I was looking for, I would have definitely continued to search until I found the bottom, which I didn't actually take that long.

10. I am engaged when using the website.

AD01: Yeah, I mean, definitely with the scavenger hunt I was looking for information, but I think that there is a lot of information on this website that you can definitely get lost in if you were interested with someone with slight interest

would probably click around a little bit, lose interest, and kind of not see all that was on the website that much. I know that a lot of these (scroll down options) have lots and lots of choices to choose from, so I think so I guess part of it is you can see all this information, but you don't really know how its important, how useful it is like "oh the entire building lighting demand versus the entire building demand of energy, okay so maybe lights need to be used a little less, so you can use that in comparison, but it's not that _?__ information. (26:26.17)

I01: So kind of the amount of work that you have to go through to get to your objective is a huge limiting factor for how far you're going to look.

AD01: So maybe if some important things are highlighted on the front page or something, that would make me more interested to go search for more information, but just having the information just presented to me, I don't really see the point of some of it. So I would go looking for more information.

I01: So level of detail, it should be finite.

Yeah, exactly, so I would

I01: Do you think that at the beginning having options and a way to filter what you're looking or would be helpful? I know that is really typical. So I guess what I'm really asking is how would it be more relevant to you as a student?

AD01: So I think going to the homepage and not just having the cute little slideshow of pictures, but "did you know..." kind of things to spark interest, that could maybe lead you to somewhere else, and then you could see the little thing at the bottom, and say "oh I actually want to know more about heating" then if the "did you know fact" was about current, then you can click on different things, I think that having basically big pictures on the front would definitely draw people in more. You already have the icons at the bottom, just blowing those up.

I01: And also maybe presenting what your impact is, what is controllable?

AD01: Yeah, what could I do to help, like that would "oh, just by turning off the light switch, lower this by like 2%" that would be a lot if everyone just did that. So just that kind of thing...

III. Content

11. I understood the purpose of this website.

AD01: Yeah, I think I did understand that they wanted to showcase the information and for how much cooling, for water and for the heating system, and overall

energy usage in each building is, and kind of show where the problem areas are. It seems like the purpose would have been better if it was more channeled to what you can do to help. But if someone was just interested in it, I feel like the website would make sense.

12. The information I found meets my needs.

AD01: Um, I feel like my needs are what can I do help; as opposed to this is just what it is. So I don't feel like it does the best job to meet a student's needs, type of thing.

13. I felt information presented by this website is meant for a more technical audience.

AD01: Yeah, I definitely think that if I had more of a control in energy usage and needed to know the numbers, it would be very helpful to me, more so than an average student who doesn't really have control of whether a light is on or off in a classroom that you're in. Obviously it has to be on when you're in there.

I01: As an educational tool is there anything that, like if you were to Google this and find it, or what would make it interesting to you?

AD01: Educational tool, because I think right now it has a pamphlet feel to it, so what would make it more like Facebook, you know? I think, maybe if I feel like it definitely needs like "what can I do with it" if I went to the web site, and decided to not wash my hands, not to not wash my hands, but to not leave the water on as long when I was my hands, and I could see it going down, maybe if I could track the progress, maybe it would be more useful for students who are always in this building to see and "oh I remember to tell my friends to turn off the lights when they're done using this room" kind of thing. And if you could see that progress, that would probably be the most educationally helpful. Maybe comparing this with different buildings would make it a little more educational just 'cause I hop around to different buildings everyday. So seeing "oh this building is green" it'd be good to know, I don't know if there's anything I would do with that information, but it'd be cool to know. So definitely agree, it's for a more technical audience.

14. I find it was difficult to relate to the energy units presented.

AD01: I definitely found it was difficult to relate to energy units, I don't know what those mean. I mean, I've taken physics, I know what kW means, but what that translates to is not very well presented on the website. Strongly agree with that.

IV. Usefulness

15. I found this website useful.

AD01: I definitely think to some extent it was useful with the graphs showing the differences between dates over the course of the year, how much energy is

used at one point. I think there's definitely a limiting factor to how useful it can be to the average student, so I think there's ways it can be improved. Or students can use it and get more out of it. So that's sort of a neutral, towards disagree.

16. I would use this website on a routine basis.

AD01: I don't think I would come more than once. Maybe once a semester just to check up on it if I happen to think of it, but its definitely not enough to put it in front of my brain like "oh let me go look at this website" probably not even once a semester.

17. Identify one energy-conservation tip provided by this website:

AD01: I don't know just if through the scavenger hunt I necessarily found anything, maybe this would be the page to go to find one (facts + definitions), I guess this has some information about the other stuff, but I don't know if it necessarily gave me any tips other than seeing them during the day, how much electrical energy was. Obviously you can turn the lights of, but I know if I found any place where it gave specific tips. Like, so just noticing now, across the bottom, next to the little ticker, I went through this whole time and didn't notice. Even just looking at this website, I almost thought it finished here and this was just something on the laptop, it wasn't as prominent, so maybe across the top it would bring your attention more, but it wasn't very helpful.

18. Please identify the feature of this website you found most useful:

AD01: Definitely the facts and definitions part at the beginning of the little booklet thing where it had what was cool about the Human Ecology building, it's kind of in an awkward place on the website, and it isn't in the best layout, it's hard to flip and read and doesn't look quite the best, but that was definitely the most useful, I didn't realize that it had all of those features that seem pretty innovative. Also some of the graphs were kind of cool to look at and were useful in the sense of comparison of "now" versus "at night" versus a month ago kind of a thing. That was definitely useful even though I didn't understand the units quite as well.

19. Please identify the feature of this website you found least useful:

AD01: Probably the amount of options on some of these pages, I don't remember which page it was on, but the ones where it just had lists and lists of parts of the building that I wouldn't, an average person wouldn't need to compare one floor versus another, or a room versus a room kind of a thing. The buildings, that's I guess interesting to see once if you actually spend more time in the building, but I don't think that it was the most useful.

END OF POST TEST INTERVIEW

Participant: AD02
Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

AD02: All right so I guess I'm clicking electrical energy to see if I can find the link. All right so I'm looking for today and that's the first thing I see. So that's good that I can immediately see how today is going and I guess it is 5:04. So I guess the right answer would be...well I guess I should scroll. So I guess the fact that I have to scroll around and compare as I'm scrolling might make it a little difficult to compare like 1pm to 10 am. But that doesn't seem to be that big a problem given that 3pm seems to be the highest, much higher than everything else. If I were to make a recommendation, I would probably change it to a line graph. Event though that wouldn't technically be statistically correct it would give you a much better idea of peaks and troughs. And you could make it so that it could squish a whole day instead of having to scroll back and forth. So 3 o'clock pm today.

AD02: The question just says highest so far today and it says specific to Human Ecology so that's good. Oh wait! I'm looking at demand. Now I'm looking at consumption, so that might be different right? Well looking at consumption, I guess it is the same from 1 to 3. So 1 o'clock to 3 o'clock pm look pretty much identical. Well that's cool that I can scroll down and see all the different areas of the building. That's cool. It would be interesting if I could even see past years.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

AD02: All right so I'm talking about today vs. yesterday in kilowatts, which I guess is important. Cause oh yeah were in megawatts. I'd imagine the actual amount doesn't change it would just be a different scale. So today vs. yesterday would be... well this tells me right here. Okay. So it is up 4.42% since yesterday, so it's in kilowatts so it has increased. So far it seems to be pretty easy to navigate and everything that I'm looking for is pretty much right in front of me. Oh that's neat so I can actually view yesterday vs. today. And there's a little line graph...the line will show you by hour as well.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

AD02: All right. So I guess I'm looking for cooled-chilled water right next to electric energy. So that is nice! It is really self-explanatory. I don't know if it is this particular computer or if it is the amount of data on this website but it definitely looks like the computer is working really hard... so I don't know if it's the site that puts a lot of demand on the computer. But anyways, so chilled water trends. It says today's maximum demand is 24 tons... but I want to know dollar equivalent in tons. So if I want to see maybe unit equivalent. Yeah. So it's taking me to dollars. That's nice green line, for money. So I want to look for maximum and dollar equivalency. It looks like 5pm is winning for demand. Dollar equivalency it would be... I'm assuming the dollar amount is just exact so maybe a little over 4.8 dollars so around 5 dollars. It's strange that it goes from 0 to 1.2 to 2.4 dollars. I'm not sure why it uses that particular scale on the graph. I'm not sure why it doesn't use something more consistent like from doesn't go from 1.0 to 2.0 to 3.0 but I guess this would be about 5 dollars.

4. Which month of the year presented the highest demand for cooling (chilled water tons)?

Transcription:

AD02: Today's maximum demand for cooling chilled water tons... as opposed to consumption. But I think it would be nice to have some definitions that differentiate between consumption and demand... but might be somewhere around here. But I don't know. Okay. Which month of the year presented the highest demand for cooling? Click on year to see what month. Okay. So... we have January for some reason only January and March actually are labeled unless I put my mouse on there which I guess doesn't matter all that much... but it does take a second [to understand]. So which month of the year presented the highest demand for cooling (chilled water tons)? So that would be the month of April, which skyrockets, but I guess that makes sense as its getting warmer. Okay.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

AD02: So heating is demand for steamed water. So I guess I'll go under heating system and that takes me immediately to steam demand and steam consumption. So I'm looking at demand. So it is nice that every page is kind of the same format so once you figure one out you figure the rest out. But it would probably be nice to have the units spelled out a bit. Because I don't think I know what MMBtu per hour means, but I can figure higher is more. Um. So which day of the month was heating consumption so far this month? So I'm going to click on this month. And I can see it will give me every other day labeled and the one in between is the one [date] in between. So scrolling it looks to be... it looks like it is April 2nd, I think. Yeah so April 2nd. Highest

demand for steamed water... Yep. And it looks like there is a little save button up here and it looks like it might save the graph. I don't know. I guess if I left or right clicked it would tell me exactly what I'd save. I assume it would be the graph.

6. The following are unique energy conservation features present in the Human Ecology Building:

Circle all that apply:

daylight harvesting,	reflective roofing	habitat restoration	supervised indoor air quality	lake source cooling
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Transcription:

AD02: So I want to look at all the conservation features. Which I think would be under floor plan maybe or facts. I guess I'll try out floor plan first. That doesn't look to be it. Maybe facts. I guess I'll try out facts. All right, I guess that makes more sense. So I want to know all of the unique conservation features. So the videos box doesn't have anything. I don't know if that's because there's something that I have to do to make the video come or if auto play makes the video show up. But I'm going to click it. Yep. Doesn't look like it does anything so I'll move my way through. It has daylight harvesting... it has reflective roofing... I assume daylight harvesting means is that it has lots of windows. It doesn't really specify what it means by daylight harvesting beyond natural light. But that probably means it has lots of windows. Reflective roofing and habitat restoration... It has quick, brief descriptions of what these things are there is not much of an explanation beyond that. It has Tuck-under parking; there isn't really a question for that but cool. Lake-source cooling... Supervised indoor air quality. It says the exhaust air from the office and lab spaces and in HEB are used in both the garage and the bathrooms. I guess I don't know what they mean by "used air" but that's just me. Oh now I see, so now they explain what they mean by lake chilling. Oh I see this has the explanations for everything that I need or would want to know. I would be nice if they had links of pop-ups so that when you are looking at the actual consumption it would remind you what all these numbers mean. What all these units mean. Even though a lot of them are pretty familiar I would expect. I'm not sure. Maybe alphabetical order would be the best way to organize these. I'm not sure. Maybe alphabetize and categorizing them; so that way you have units alphabetized and building aspects alphabetized instead of kind of squishing them all together.

7. Second floor plug load energy consumption was lowest at what time today?_ AM/ PM

Transcription:

AD02: So now I want to look at the floors. Now I'm going to the floor plan and the categories are. I think. It starts me off on the second floor and the categories are.. So just to see what *categories* mean: lighting load, systems' load, and

building load. So I want plug load. This looks like the floor outlines. I'm not sure how helpful these are but I'm going to find out. So I want to know what time of the day it was the lowest. I guess I can view a chart, which would be helpful. Second floor plug load. It says today. So I'm looking for what time it was the lowest? And that's one am today. And from every other chart it looks like everything is the lowest around one am. I guess this chart just gives you the most up-to-date information about time of day. I may make it more obvious that you can look at a chart somewhere on this page. I see there is *view chart*. But you .. Or you might want to have the chart be the thing that pops up first like in the other pages. So that you can just see all day... and then you can pick month year or whatever you want instead of pointing out just today... and having this kind of diagram that doesn't really, doesn't seem to show much beyond, this is what the floor plan looks like and where are faculty teaching and research are.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

AD02: Oh I'm done! Okay. Well... As to describe what I believe the mission of this website is... It may be to increase awareness of energy usage, of all the different kinds of energy uses that are being used. Water use and electrical and all those things that play out as the building is used. I'm going to write all those things too... talking out loud... sorry. So perhaps to increase awareness and understanding regarding energy consumption as well as types of energy used and the various ways it is consumed. Yep.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

AD02: And then I need to identify one way the website can help me conserve energy. That's a good question. Um. Thus far I don't really see ways that this website really gives me any ways or any hints as to how to do so. Maybe the scrolling thing at the bottom; oh yeah, the little scroll thing at the bottom does give you some suggestions. Don't set your thermostat at a colder setting than normal when you turn on your air-conditioning. I don't think this would help me for this building as I don't even know where the air-conditioning setting is or if we can do that. Um. But it could be helpful for just being at home. I guess what I would say is while there is a ton of information on this website... and it is really cool... and maybe if someone has the where-with-all to come on here and look at these things everyday maybe they might get a feel for what high energy use is and what low energy usage looks like... then perhaps; well I don't see how at an individual level how their behavior is going to reflect a difference in energy use. I guess one way the website would help is... beyond just giving you an awareness of all the types of energy used which may raise awareness of water and energy... at least awareness could lead to remembering

to turn lights off or computers off or that sort of thing. Um. It may be helpful beyond having the scroll down way at the bottom that just kind of goes... maybe have suggestions for each type of energy as you are looking at. So if I'm looking at electricity trends, maybe making this scroll thing more prominent or having pop-ups or something that lets me know. Or maybe an explanation as to why energy trends tend to be this way or at least maybe an average [energy trend] that I can compare to today. So instead of just having... Well there's unit... there's the unit equivalent thing so I know how much money my energy usage is. Or days of laptop usage. These equivalent things don't seem to give me a real meaningful way of discerning what these numbers mean and how I might change behavior. So I guess... increasing awareness of all the types of energy use and possibly attempting to obtain an understanding of how this relates to daily life/activity. I guess you could... if you know what peak hours are... you could reduce your consumption at those hours and work at different hours where energy usage is lower.

END OF TASK ANALYSIS

Participant: AD02

Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

AD02: Yea, I liked the way it looked, but I like graphs. Visually, aesthetically I don't see a problem with it.

2. The layout of the website is well organized.

AD02: Now I'll go back to home just to remind myself what it looks like, starting out as the first page you see. You can see pictures on the homepage; you can see the goal "help shape behavior, resource decisions and academic mission on sustainability... to compare energy across time and buildings." So perhaps, its definitely good to start out with our goal, but what I might suggest is something explaining all the little tabs down here, so I'm not guessing what's what or what I should be looking at when I'm curious about a particular thing. Or maybe suggesting, take a look at water consumption, energy and maybe have an explanation of how the building is superior to the other buildings on the page. I'm actually looking at the differences in consumption rather than jumping back and forth to see what consumption is and why it might be better than other buildings. It's cool that I can compare other buildings, but I guess, well I might be able to compare the other buildings, I'm not sure. Doesn't look like I can compare this to other buildings on campus, or at least I haven't figured it out yet. I'm not sure what "auto play" is. It doesn't seem to do anything. So this I have to go with disagree for well organized if the goal is to help shape behavior, otherwise its kind of self guided and there's no actual underlying order, or meaning to anything, its just kind of random. You pick where you go and look at what it is. At least me, in particular, really wouldn't know what context to put all this in, what I'm looking at. I assume you could build context if you look at it every single day, and start to get a feel for what it's like. If you look back in the histories of things, but there seems to be so much data and so much information here, that I think someone would just get overwhelmed, wouldn't know where to start. Probably give up on it cause [/because/], unless they had some sort of specific goal, or something, that they were looking toward, it doesn't really engender ability to grasp an understanding of what these trends mean, or what they look like. This is

higher, this is lower at this time, maybe its obvious it would be higher this time of the year over this time of the year.

3. This website has appropriate use of color.

AD02: As far as color usage, I think color usage is fine. Maybe the little bar at the bottom with all the suggestions can be highlighted a little more.

4. The pages on the website are visually consistent.

AD02: Yeah, for the most part, all the ones that involve energy consumption, where I can actually look at the amount of energy used, or the money it costs, or whatever—that's all consistent. So I know what kinds of information to expect on every page that involves energy usage. The report page, I really have no idea what the report page asks for, so as far as that page, I don't know what I'd use it for, I assume it's for someone who keeps track of these, and prints these out. It looks like for someone who would be more specialized, not just someone who's interested in energy usage. The current demand page is helpful, actually. Yeah, I guess this might be my favorite page, which I don't think I even got to in the 9 questions. Well this one kind of gives you what a lot of consumption is versus a little consumption with the little dials and charts that are easier to follow. It encompasses more, it gives you the idea of if it's going up or down 'cause [/because/] I don't think anybody is going to pay a lot of attention to the specific numbers on the y-axis.

5. In general, it's a good balance between graphical and textual information.

AD02: I would say there's a lot of graphical information, and that's a good thing for the most part, but it would be nice if the textual information that explains some of these things were somehow available on the same page as the graphs. It would be nice if, well, on the current demand page it's a little more obvious what high or low means, but instead of just comparing other things, it might be nice to say "on average this is high" "on average this is a low amount of energy usage." That's one thing, to give people kind of an impression of what the graph means.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

AD02: So navigation, organization of the various functions of the website were consistent across pages pretty much. Once again, probably energy parts of this are consistent. So overall...the floor plan page is kind of confusing. The facts and definitions section can be incorporated into the other aspects as well... and the report page doesn't make much sense to me, but anything dealing with actual usage of energy is very consistent.

AD02: How can it be improved? Well once again, adding more meaningful information to give someone an idea of the context of this usage, and overall context. What's a lot, what a little? How does this compare to buildings that are not like this, but similar in size? If that's possible, I don't know. And once again, making it easier to link definitions of things.

7. Remembering where I am on this website is easy.

AD02: Yeah, I'm not getting lost.

8. The organization of the menu on each page is quite logical.

AD02: Yeah, everything fits together. Maybe some of the things, so for "click to view break up" I just discovered, it popup with a thing that says "usage breakup" into sub-meters, which I figured out once I click it, but I wouldn't really know to do that, I wouldn't really know what that means, until I clicked on it. But I do like the pie chart.

AD02: Yea, like, "why would I click on this button" "what am I looking for." Or if I wanted a pie chart, would I know that's the button I should be clicking. It puts all this together, 'cause I do like the pie chart, I like to see "oh, this is all consumption and this the break up, it is nifty." It would be nice to have something on the homepage that would get you into all this stuff, instead of "go find it, and figure it out on your own, search around until you understand something." But I think the menu is logical once you understand what everything is, maybe it's just a learning curve.

9. Few mouse clicks are needed to find a given piece of information on this site.

AD02: A few mouse clicks are needed to find information on the site. I agree with that. It didn't take me many mouse clicks, as long I knew what I was looking for. Certainly.

10. I am engaged when using the website. 13. I felt information presented by this website is meant for a more technical audience.

AD02: So the information provided is meant for a more technical audience. Yeah, that pretty much captures it doesn't it. It requires a lot of self guided exploration and motivation, which would be for someone who's trying to, a technical person.

14. I find it was difficult to relate to the energy units presented.

AD02: It is difficult to relate to the energy units presented. Yeah, maybe it's just me. You're comparing a whole building to a 13-watt CFL. These numbers are huge. Because it's a 13-watt CFL, so I'm assuming you're just dividing. The units are different because of the 13-watt CFL, and the building is in kW. I guess money can help because that can give someone an idea... it's this many dollars every single hour of every day. Perhaps there's somewhere on here where it will just tell you just totals of the day, I'm sure it would do that.

Dollars may help a little more, it may have meaning to people, people know what a dollar costs, things cost a dollar, but it could still require context. How much does it generally cost to run a building? I'm looking at it over and over. 90-watt laptop usage, so these numbers are huge too, 'cause [/because/] it's comparing a building to a laptop. It's trying to put it in terms of something you understand. I understand how much energy... I have more feel for what a laptop uses, but once you start using numbers, there's like 2,916 days having my laptop on. It just becomes a meaningless number to me.

IV. Usefulness

15. I found this website useful.

AD02: Um, for the task at hand it was useful, I like the idea of it, I do worry about the audience. If it's for a more technical audience, like I said, I think this would be fine. But if you're actually trying to get something across to people, like how this building supports green energy, reduces consumption, and how to reduce consumption, and the amount of chilled water cooled means to me and how to prevent that, I don't know if it really does that job. Even how outside air temperature, what these things, how these things are relating. I think it would take a lot of motivation, and a lot of self exploration to really get your own understanding, which is not something you really want when your trying to get an idea across to people that probably don't have much time.

16. I would use this website on a routine basis.

AD02: Um, probably not in its current form, I probably wouldn't come back to this, 'cause since I saw the graphs, I immediately forget what I saw. I wouldn't be able to tell you... You want something like, I can remember today's pretty warm compared to yesterday, yesterday was really cold. It was like 30 and windy, whereas today is nicer. Something like a temperature, I can relate to it, I can remember it, its an everyday thing. So I think for something like this, if you want to get something like that across, like the home page, there are the, whatever the top 3 indices are for energy consumption per person, where they can pop up on this first main page, give them boom, "oh that's today right." And they would probably remember. And they would say "why is this that day? And like, I wonder why." Maybe once a semester, if I got curious, maybe several, I don't know.

17. Identify one energy-conservation tip provided by this website:

AD02: Define 1 conservation tip... Automatic temperature cut off. So even the tips, I would say that I'm bias. I have a safe memory. But if people don't know why, they wouldn't remember it at all. But if you give them a list of these things that they can have today, like if someone gave it to me today, and then a week from now, told me to write them down, what are you numbers for the list of things to help you use less energy. What are your numbers, I would probably perform very poorly. Which your ceiling fan, they're trying. The ceiling fan with your

window air conditioning is going to spread the cooled air more effectively throughout the room, I'd say "yeah, that makes sense."

18. Please identify the feature of this website you found most useful:

AD02: Feature was most useful. I don't know, I like the current demand page, I think. That's getting closer to what I was talking about, I think, you got like 3 meters here, like 3 graphs, they can still probably break it down into something that was a little less information all at once. So you just get an idea, "oh today, its been bad, compared to yesterday." But this is definitely closer to a home page, where I can just see. So I guess that's what I'll go with.

19. Please identify the feature of this website you found least useful:

AD02: The feature of the website I found least useful. If I spent more time, maybe the report page would be helpful. The floor plan doesn't seem to be my least favorite for some reason. And the comparison, wildly impressive, I think who needs to know what the first floor lighting energy use is, unless you're really invested in 1st floor lighting. I guess I could find out. An easier way to navigate, I'm in this building all the time, so if I could find oh, the grad lounge uses this much energy, that would be helpful. I could say, oh man, we're doing a crappy job. If I could easily find where that area is, 'cause I know that's where I use electricity. That or my lab, which I'm sure could be found somewhere on here, I definitely see how that would be really difficult to do too. I don't envy that job.

END OF POST TEST INTERVIEW

Participant: AD03

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

AD03: Currently I'm looking at this picture. The red and green combinations seem to be working really well together. The nature also blends in pretty well. For this one there is a picture of the Human Ecology building.

I01: The point is to make sure that you are answering the question. You have to use the website to answer the specific questions. The answers will be in the website. You will have to figure out how to navigate the website in order to figure out the answers.

AD03: Oh Okay. So now I am just browsing through the website to find the answers to the first nine questions. I feel like this website is kind of confusing with a lot of text. I'm not sure where to click to find the answers.

AD03: So I'm trying to answer the first question... So I'm clicking electricity energy. It was kind of hard to find at first. So today, I clicked on today. So highest consumption is at 11am. And I'm now moving on to the next question. But before I move on I am just going to comment on the aesthetics of it. I feel like the black text and the red text seem to be not as attractive. I'm going to move on the second question.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
-----------	-------------	-----------

Transcription:

AD03: Compared to yesterday so I'm going to click on the last 24hrs. According to this it decreased by 3.27% but it was hard to find at first because there was a lot of text and a lot of graphs. Moving on to the third question.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

AD03: So I clicked on the cooling which was very obvious. And I clicked on today. And it was quite easy to find the demand button. It was quite easy to find the demand button. Um I guess it is 17.71 but I'm not sure, because from the table it wasn't so obvious as to where I should be finding this answer.

4. Which month of the year presented the highest demand for cooling (chilled water tons)?

Transcription:

AD03: Moving on to question four...

AD03: I'm just going to click this year. From here it seems to be April but I feel that overall it is very confusing as to where I should find this information because there is a lot of things going on in the left and on the right.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

AD03: So moving on question five...

AD03: So click on heating.

I01: Make sure to comment on aesthetics and graphics.

AD03: Okay. That works. I feel that there is a lot going on and especially for this particular question it is pretty straight forward because you just look at the x-axis and also there are a lot of cursors around it so it is easier to follow. And I actually think that the red goes well against the green background so it is easier to follow. I feel like from here [this graph] it is kind of hard to follow because they [the bars] are not all on one page because you have to scroll it so I have to compare it. So maybe if there was an app that allowed me to calculate it a little bit better, like maybe on the side, that would improve it a little bit. It looks like it was April 2nd of 2013, which was highest so far.

6. The following are unique energy conservation features present in the Human Ecology Building:

Circle all that apply:

daylight	reflective	habitat	supervised	lake	source
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harvesting,	roofing	restoration	indoor quality	air	cooling
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Transcription:

AD03: Moving on to question six...

AD03: For here I'm just not sure where to click because there isn't a tab that says energy conservation features. So I'm just going to browse around and see what I can find. So now I'm looking around at other parts. I feel like the comparison one is kind of hard to follow because I'm not sure what they are looking for. So when I clicked on the entire building demand it came up but at first it was little confusing. But I think that the blue really works well with the red in this case. So now I'm back to the total energy trends and I'm going to click on total energy consumption. I'm just not quite sure on where to find it. I'm going to click on help. It is not quite working. I'm going to pause the recording for now. Currently I can't find the answer for question six so I'm going to move on to question seven...

7. Second floor plug load energy consumption was lowest at what time today?_ AM/ PM

Transcription:

AD03: So it talks about the plug load energy consumption. So I was going to click on energy and energy consumption. That was quite easy to follow because it was on the left hand side. So I'm going to click on second floor. Okay. Lets see. I hope there is another button that talks about second floor but I can't really find it on this website. Maybe floor plan might help. Maybe floor plan would have it. Um. But I guess from this graph it says it is at 2am but I'm not sure if it is the second floor because it doesn't actually state it on the website.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

AD03: I'm going to move on to question eight...

AD03: It is probably to improve on the aesthetics of it. Probably the recommendation I would give ...would be maybe improve a little on the right hand side it seems really dark and I can't really see it as well. But I really like the left hand side because it was easy to follow. So, maybe the tabs perhaps make it a little bit darker so that people can actually see them. Because I didn't know it was part of the website before.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

AD03: I think this is a really good website because you can click on different areas like cooling, chilled water, heating, steam and there is electricity energy. So you can actually compare it and see how the current energy expenditure is and perhaps compare to how you are actually improving it. So with comparisons you can actually see if the method is actually working or not.

END OF TASK ANALYSIS

Participant: AD03

Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

AD03: I think it's neutral because I think there's still a lot of work to be done with it. I really like the part where there's an arrow with the green going down. But I think maybe if you make the tabs at the bottom more attractive, maybe it's more obvious.

2. The layout of the website is well organized.

AD03: Um, I think it's really condensed, maybe like decrease some of the stuff because I'm just not sure where my eye should be focusing on. So maybe just have all the information on the left and right combined to one, and put it on the left side. So I guess it's neutral.

3. This website has appropriate use of color.

AD03: So I definitely agree, the graphs really work, and also the background, it blends really well. Um, yeah, so I agree with that.

4. The pages on the website are visually consistent.

AD03: When I flip from page to page they have a similar look and feel, which helps me find answers more quickly. It's really confusing sometimes because they have the same layout on the left side and the right side, but sometimes they might have like a bigger graph, so it confuses me a little. So it's kind of hard to find answers on that. So disagree.

5. In general, it's a good balance between graphical and textual information.

AD03: Um, it has a good balance, so yeah because like I could find some of the answers, and there was enough text, like I really need to take time to look at it before I get the answer, but there's enough text on there.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

AD03: I guess like for some of them it's pretty consistent, but for some of them it isn't quite, so I'll be neutral on that. And how can it be improved? Um maybe, as I was saying, put a graph on the right hand side and the text on the left hand side so people don't get confused as to where they should focus their attention on.

7. Remembering where I am on this website is easy.

AD03: Yeah, I definitely agree with that it was easy to follow.

8. The organization of the menu on each page is quite logical.

AD03: I think it's okay, so I just agree with that.

9. Few mouse clicks are needed to find a given piece of information on this site.

AD03: Um, I kind of disagree with that because for some parts I had to click around a lot of times especially for the help button, it was hard to click on it, and it didn't really work, so or maybe it's just me.

10. I am engaged when using the website.

AD03: Yeah, definitely agree because there's so much going on and you're trying to find so many information, like definitely my eyes were like everywhere, and I was like really concentrated on that.

III. Content

11. I understood the purpose of this website.

AD03: Um, I think that the questions really help, so I definitely agree because you just want to reduce energy consumption and test out if this dashboard might actually work out.

12. The information I found meets my needs.

AD03: Um, I definitely agree, but sometimes it didn't really work out because I wasn't really sure where to look for the information, but mostly it serves that purpose.

I01: Can you expand on that a little bit? What you think your needs as a student would be?

AD03: Yeah, for me I definitely want to know how much energy consumption I'm using right now, and maybe provide that information. I think making it more clearer as to how much consumption you need right now and then see what we should be doing in the future. So that could be a really good way of doing that.

13. I felt information presented by this website is meant for a more technical audience.

AD03: I definitely think so because from like the, all the information, although it's not that technical language, but I feel like the audience is definitely up for their environmental, really into environmental standards stuff, but the language itself is easy to follow, even for non-environmental majors.

I01: Are there any features that you would change?

AD03: Like language, like text...um, I think, I feel like for entropy, and humidity and temperature, like entropy, since I'm a science major, like it makes sense to me, but for people who are non-majors, maybe they don't know what entropy is, or BTU, maybe making it more measureable to them, and give a comparison as to like "this is how much energy in joules" do they know many joules it is or kilocalories? Making the comparison to it can help them understand

I01: What about the layout, what could you change to make it more useable, more user-friendly?

AD03: Yeah, I guess I feel this one is so confusing (total energy page), it's so grey, at the bottom of it, I can't, it's really hard, like it's grey, it blends in with the background, so I didn't really see it until you told me about it. So maybe making it darker, or maybe even making it on the side, sometimes they make it, and also moving this part to like this area, and on the top because that's really important. But for these type of tabs, I think it's okay here, but making it a little smaller. Yeah, because it was like so confusing, like with these 2 areas, where my eye should be focusing on.

I01: So you feel like your attention is being split?

AD03: Yeah, I feel like it's 3 different things because when I'm finding information, I look at cooling, okay that makes sense, but if there's another word I should be looking at, I would go "okay, is it on the left side or the right side or on the bottom" so my mind is constantly not sure where it should be.

I01: Is there anything about the graph that is distracting or is unclear? I think the only thing I would talk about the graph is maybe like the scrolly button (scrolls through total energy graph) makes it really like, if you're finding information of which one is highest, it's kind of hard, because some might be quite close together. Making it slightly larger and not having to scroll it would be better,

but I think overall it's really well done, it's easy to find information that was on the graph.

I01: Okay, so once you were able to get a sense of the navigation, how to click on it

AD03: Yeah, and it was easier to follow.

I01: Okay, yeah

14. I find it was difficult to relate to the energy units presented.

AD03: Um, yeah, we talked about this earlier, because I'm a science major, so it makes it easier for me to understand what BTU is and MMBtu. But I think for a non-science major having a more equivalent energy unit that they actually understand might be better.

IV. Usefulness

15. I found this website useful.

AD03: It definitely was useful, um despite there being so much information going on, for answering the question, it really helps with it

16. I would use this website on a routine basis.

AD03: Um, I think maybe not, but I think that if you make less tabs, and its just really concise, maybe I'll start using it because there's so much going on. I'm just not sure where I should be focusing my attention on. Um, but I'll probably use this website probably like several times a semester. Depending on if there's a project on it.

17. Identify one energy-conservation tip provided by this website:

AD03: Um, I didn't really find the answer to this question. But according to the tab maybe water could be one if I click on it. I don't think they really mention about conservation method in this. They only talk about how much consumption is made, but what improvements are made. Maybe they didn't really specify that. So...(clicks on facts and definitions) I think I found the answer for question 6. I think daylight harvesting, but that's only for building facts, I'm not sure for real-life situations how that would happen.

18. Please identify the feature of this website you found most useful:

AD03: I think definitely the part on the right (clicked on total energy) with the arrow pointing down with the unit equivalence, today's consumption is how much, that really helped me in understanding the data itself.

19. Please identify the feature of this website you found least useful:

AD03: Um, I think personally maybe the left bottom when it talks about compared to building baseline, per square foot, and outside air temperature, like I didn't really use that, so yeah, I didn't really think that was really useful.

I01: Is there any way you would adapt this website so that students would be able to use energy dashboards in their day to day experiences, or like would it honestly be relevant to you?

AD03: Because I feel like for buildings, maybe yes, but I think making it as an app, or a smaller thing, and I think "cooling water" and "heating steam" really is applicable because people with apartments definitely want to know how to save money, so if you target that, and say "you can save "x" amount of water per semester, like using educational terms that would really help. I could save that much for internet. You're spending already that much for internet, why don't you save that much and not even having to pay for it. So that might be something

I01: How do you feel you would be able to target students, to get them to access it and what medium would it be more accessible. How would you get the word out?

AD03: Um, I feel like a lot of classes let you do projects, especially energy projects, and then I think you can suggest it to libraries and also even to classes if they have projects due. So like sometimes putting your name down, students would use it, that's how I got to use my medium, it's really helpful

I01: What kind of classes, you said you're biology?

AD03: Yeah, I'm food science, but I took a natural resources class and a SNES [/Science of Natural and Environmental Systems/] class and I know a few people there. They love it. This is something that they use from a day-to-day basis. So like, if I was suggesting this website to them, they would really like it. Yeah, look into that, they would use it for sure.

END OF POST TEST INTERVIEW

Participant: AD04
Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

AD04: Okay. So I will be working on question one...

AD04: I guess I would go to the bottom. Electrical. Oh that's cool! It kind of pops up! I would say so far it is really easy to find. All of the tabs are along either the horizontal or vertical planes so that makes it really nice; I really like that. That is also a nice graph. So highest so far today...11am. In terms of experience, I don't know, this is nice. The colors are very complementary. In terms of content, there is a lot going on here. There is a lot going on.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

AD04: Okay. So now I will be doing question two...

AD04: Today's electricity consumption has ... compared to yesterday. Okay. So like I said there is a lot going on here. So it is kind of hard to see. I guess I am going to try this week. I think that once you know what to do it becomes very easy. I just kind of like the fact that like the whole demand energy is along one axis...

but there are things along the vertical axis too so that makes it hard you know? Like “view the page breakup”.

AD04: I do think it is interesting, though, how much information is given to you. Like I’m scrolling through and you can actually see each individual facet in very specific detail and I like that.

3. Today’s maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

AD04: All right so I’m moving on to question three...

AD04: Lets go back to what is this called; what would you call the thing at the bottom? Icon options. That’s what I’m going to call them, icon-options. I really like them actually, it’s nice because the word is there but it also gives you a little visual. So it is nice, like the mac setup where you can visualize but you don’t have to read what each thing is. You can just visualize...especially if you are going to be using this often. All right where was I? Today’s maximum demand for cooling is equivalent to? Okay. Lets see. That’s very cool! (Looking at the unit conversion feature). In terms of content available, there is a lot of stuff available but I think it is hard to find it. So for like question three, it asks you for the unit equivalent in dollars. So you can click on unit equivalent and dollars but I think it wasn’t made clear where you would find it. So things to think about. I’m going to say about eleven dollars. I really like how easy it is to find things... I mean once you know where something is, the icons make it very easy to know where to find things. All right.

AD04: So like I said, it was kind of hard to see where you would change/add the dollar access but once I found it, the icons made it really easy to choose. So today’s maximum demand for cooling is about 11 dollars, I’ll say. Okay. I like that there’s a lot of the color contrast. Especially with a graph, I think it is very easy to see the difference especially with a bar graph. Especially having the dollar view in terms of a line. That’s nice. In terms of navigation experience, I think now that I’m getting a little bit used to it is fine, but the icons do make it a little bit easier. I’m moving on to question four.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

AD04: All right so I’m moving on to question four now...

AD04: Which month of the year presented the highest energy demand in tons. In tons. Okay. Yes. I really like how all of the icons are arranged in a very sequential fashion and they are very easy to read and figure out what you need. I’m still

not very sure what is going on over here (show last year on bottom left hand side). Maybe I will click on here... show last year. I don't really know what that is. Okay. I feel as if this is easy to use... but the location of things, unless you have done it before it is hard to find where things within things, things are. And to clarify what that means... so to add the dollars axis I had to go under equivalent but if I wanted to change the time-frame it was along the bottom... I just think that if everything were along one axis it would be so much easier to figure out where I need go to get a certain parameter changed.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

So I will be moving on to question five...

AD04: Okay. So this is really nice. We have a nice little icon at the bottom to figure it out. I like that they are all set up the same way. Sometimes when I feel like other websites, when you click on one tab it sort of opens another one so it is very cohesive and integrated.

AD04: Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month? Wow! There is a lot of spending certain days. April 2nd. Right. Like I said, I feel as if the bar graph makes it very easy to discern the information that we are looking for but I feel like I've said that already.

6. From Jan 1st to April 1st, how much electricity (kW/person) did the highest energy consuming residential dormitory use per person? _ kW/person

Transcription:

AD04: Moving on to questions six...

AD04: Ok so on question six, I'm not really sure where I would find this. So the icons were really helpful when you are looking for numbers but now it is very hard to tell where I would go for this. So I looked under current demand to see if that has any information. I looked under report thinking that I would find a report of all the different energy saving techniques but it wasn't really there. I think it is very. I think it is hard to tell where I would go for this. So I think the icons were helpful when you were looking for numbers, but for the written content it doesn't really work. So I don't think of green facts as what HEB is doing. Do you know what I mean? I think it should be termed differently. And this is also a very different format than the other couple of pages I was looking at. It is too bright almost. They do have habitat restoration, reflective roofing... lake source cooling, and indoor air quality. So, all of the above. I think it is nice that it was set up like a book. But I think it would be easier for me to extract information, if it was just a visual list instead of a book that you have to

flip through. I feel annoyed that I have to flip through. I think that it should be just a visual list instead of a book that you have to flip through. And from there you could click on it to get more information about something.

7. Second floor plug load energy consumption was lowest at what time today?_ AM/ PM

Transcription:

AD04: Okay. Plug load energy consumption. I don't know if plug load energy consumption would be under electrical energy or if that is under total energy so I guess I'm going to click around until I find it. So this is what I was saying earlier. The fact that you have entire building demand... this information panel is along this panel and not along the other axis and it is just so small. I just would never think to look here. So at this point I'm just scrolling around this information panel and trying to find second floor plug load energy consumption. The problem of these little things with different floors receptacles and different places... is that it is a very long list and it is in the tiniest little corner of this screen. I'm glad that I looked here otherwise I would have never found it. So I guess I'm going to click second floor. This is one of those things that I think if you used it enough you would be use to it but I guess it is just annoying to click through everything. Yeah, this is set up the same as it was for the earlier questions and it is kind of nice that it is set up in the same way as the other questions but I now I just don't know. Now I'm just kind of annoyed that I had to click through all that to find it. But then again if I used it often enough then maybe I would be able to find it (be more familiar with it). Lowest at what time today? Yeah. I really like the way the information is presented. It is very easy to tell once you find what you are looking for you can leave with the information. But I think the problem I have is that that sometimes I don't know where to go to find it. And while I like the icons, they are not giving me a good idea of where things are. And having to know that I had to go to this left-hand corner and using it for the first time today, I didn't know where to go to find it...I feel that was just not fun to look up I guess. And the thing is also; there are so many different little options...there is 2nd floor plug load lighting, demand and consumption... I just feel as if it would be nice if there was a list and you could click... Oh I just want to look at the entire building or the second floor or the first and from there have consumption, demand or whatever. I just think it should be bigger! I mean the font is fine and it looks fine but I just don't understand why it has to be in this tiny little corner. Also I think it is weird that the font is different on right and on the left hand corner...

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

AD04: Anyhow, question eight...On to question eight...

AD04: So I'm going to go to the homepage. The homepage has the dashboards. I guess I actually have to think about this. I think the mission is to make getting knowledge about energy sources easy and to have that knowledge influence change. I mean in terms of where I got that... why I believe that. The emphasis seems to be on different sources of energy and then comparing and then reporting. So the icons are different sources of energy and then reporting and then thinking about how it all works together. I really like the homepage actually. I wish the font were more consistent...now that I've noticed that it is really starting to bother me.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

AD04: Okay. Moving on to question nine...

AD04: I think ... lets see... what is this weather icon? I guess if I had to say one way this would help me conserve energy... would be to know. I think that once you know there are X-number of dollars being spent on a certain technology or a certain resource you are more likely to cut back. But I think also just knowing when the peak hours are. It is interesting that the peak hours of energy/light consumption are when it is light or when there is sun outside. So just having that influence my behavior... so knowing how much the cost of each technology is and having that cost influence my behavior to conserve and reduce cost ... Because I feel that they have so many technologies, these chilled water cooling systems and reflective roofing... It was really weird to see the number of dollars being spent on something. I think that is what would make me change my behavior.

END OF TASK ANALYSIS

Participant: AD04
Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

AD04: I agree with that, I will say that's a 2, and I think that's because the colors work well together, and also it's Cornell colors, so that's kind of nice. But I do think that it doesn't like blind you, it's not like one of those website that have black background with brown writing, so it's not impossible to read, I think the contrast of the colors is working really well. Like for example, there's red on white, or there's red background on the white letters, and that makes it easier to read, so that's good.

2. The layout of the website is well organized.

AD04: Okay, I'm gonna say neutral, just because while I do like the icons a lot, and that makes it easy to find stuff, I feel as if once you get to the correct icon that you're looking for, within that, it's hard to find the information, so like you know when I was doing that question about plug demand, I could find where I would have to go, but then it was hard to find once I got there. You know, I had to scroll through a bunch of different stuff a couple of times before I found it, it was just easy to get kind of lost. But I think overall, the little icons make it easier. I like the icons.

3. This website has appropriate use of color.

AD04: Yes strongly agree. I like it. I like the contrast. I like it a lot.

4. The pages on the website are visually consistent.

AD04: Yes, I also strongly agree with that, and like I was saying, I feel like the fact that each of the icons have the same type of bar graph, and the same location for everything, so that's really nice. Once you hunt something down and you know where it is, it's easy to find that again and again on different pages, so that's really nice.

5. In general, it's a good balance between graphical and textual information.

AD04: Hmm, I'm neutral, okay, the reason I'm neutral is because I think the graphs are really easy to read, especially when they're bar graphs, and there are line graphs, and I think that makes it easy to tell, leave with the information you wanted to have, but the problem, I don't think they have a lot of textual information, but I don't know if you need to have it just because you have very easy to understand graphs. Um, maybe if there was a really crazy change in the graph, I would like to have it explained with text, but I don't think they had a lot of textual information, but I don't think it was necessary.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

AD04: Agree, I'll say agree for 1a, or 2a sorry. I agree because I think when you're looking at the different energies like "total energy" "electrical energy" "steam" I feel like those were very consistent, but when I went to things such as like compare, or report, or even facts and definitions, the website was no long consistent. So how can it be improved... I think it can be improved if you made lists, but had the lists be readily visible. So instead of having to scroll through a million things, you know, have a list of 5 things, maybe you can click on it and it would go to a next list, and the next list, so it would be building. You could click on which building. You could click on which floor in the building, and then which room in the building. It would make it easier to find things, instead of having to scroll through a list of a million different rooms, you can just pick the building, and that would automatically narrow it down to the rooms in that building. So yeah, make less, and make it easy to find the... All right 2b.

7. Remembering where I am on this website is easy.

AD04: Yes, I agree, and I think that's also because it's very consistent and it's easy to find information, and it's labeled well. Like, the axes for example.

8. The organization of the menu on each page is quite logical.

AD04: I agree with 2c. I think the organization is logical, but I think when you're first using it, it's hard to understand why certain icons are under menu and certain things are not, so having to go and change an axis to look at the dollar amount spent is under menu, but other things, such as seeing the demand last year is not, so I think there should be... either everything should be under a menu, or everything should be available to you right there.

9. Few mouse clicks are needed to find a given piece of information on this site.

AD04: Strongly agree, yeah. I think it's very easy to find information, and it's very easy to understand information.

10. I am engaged when using the website.

AD04: I agree with that, 2e, I agree with. I think it's easy to get kind of frustrated, but it was also my first time, but I do think that because you can't get information so quickly, you're engaged while you're looking through.

III. Content

11. I understood the purpose of this website.

AD04: Strongly agree, yes I think it made it really clear that it wanted to show different energy expenditures and what HEB is doing to reduce, or what alternative energy sources HEB is using. And I think that the fact that they have a reporting tool, or comparison tool makes it easy to discern that. Okay, let me write that down... it was easy to discern...

12. The information I found meets my needs.

AD04: Strongly agree, yeah, I strongly agree because I was able to answer the questions that were asked. And I actually learned some stuff, so that was kind of cool. I think it was made a lot easier by the fact that they had graphs.

13. I felt information presented by this website is meant for a more technical audience.

AD04: I disagree, I think that's not true. Um, the information was displayed in a way that was easy to understand the graphs weren't very complicated. And also I just felt the fact that they um, didn't, if you're looking, sorry, I don't know what I'm trying to say. The more technical audience they were going for, there would be more emphasis on the numbers associated, whereas here there was a lot more emphasis on seeing trends and not just looking at dollar amounts, I mean it was an option, you could do it, but the icons, how cute it was, like the little dollar, the little dialer icon makes me think it wasn't meant for a very technical audience.

14. I find it was difficult to relate to the energy units presented.

AD04: Disagree. I disagree with that. I think the fact that they had tons, but they also had dollar amounts, they had a couple of other equivalents that they could transfer it to, and I feel like if you don't know what 11 dollars is, I don't know.

IV. Usefulness

15. I found this website useful.

AD04: Strongly agree, I learned a lot in 20 minutes that I've been sitting here, so that's cool.

16. I would use this website on a routine basis.

AD04: I would say I would use it maybe once a month. You know, I think that it make it, I think it depends on, like I personally would use it once a month, but I can see other individuals that would maybe come back to it more often and have it affect their decisions about what resources their using and when they use them.

17. Identify one energy-conservation tip provided by this website:

AD04: A tip provided by the website. I don't think I found any. I could deduce, you know, don't leave things plugged in for longer than they need to be, but the website itself, aside from showing how much was being spent, didn't give us any tips (on homepage with scrolling bar).

18. Please identify the feature of this website you found most useful:

AD04: The ability to convert to dollar amounts. I think if you don't understand what tons is, or the other units, that makes it a lot easier to see the cost effectiveness of conservation.

19. Please identify the feature of this website you found least useful:

AD04: The weather icon, actually yeah, I don't really know how that's supposed to play into this website, I guess I didn't understand why it was there, I guess if they had given us like a tip "oh it's going to be cloudy today" so there's not going to be as much light from some other alternative source, so try to use less energy, I don't know, I don't understand why it was there I guess. It's just kind of misplaced, I felt. All right I think I'm done.

I01: I'm just going to ask you 2 more questions. How do you think this could be changed to make it more relevant to students?

AD04: I think for me, I don't know how... like I said I don't think I would go on here more than once a month, but I think giving tips, tips that people can actually follow, you know I feel... one of the questions was to identify one tip. I can think of one "oh, don't leave stuff plugged in" but I think if you incorporated the weather with "oh if it's cloudy there's not going to be as much reflective roof energy created, so be aware of that," something like that, that's something

that would maybe alter my behavior. But like, I don't know any tips off the top of my head. So I think that would be helpful.

I01: Yeah, and then I guess, would this be something you be interested in finding more about the buildings that you use frequently or is a tool like this more relevant if it shows you the impact you're having?

AD04: I would say both because I feel, so for my program, I'm in different buildings all the time. And I think it would be interesting to see, you know it's really funny that some buildings are always really cold when they're air conditioned, and I always wonder "why, that can't be good for the energy cost of the world, or the school. So I think it would be interesting to see the effect on the building level, and for me personally to see how did I contribute, you know, if I'm here at 10 in the morning, how are my costs [reduced].

I01: Reduced.

AD04: Yeah.

I01: Okay, so this is my... what I'm sacrificing, like what's the result, and how can I maximize... what actions will maximize the results.

AD04: Exactly, right, because sometimes I feel like you do things that are ... not actually contributing. Right, and you feel good, but you're not actually doing all that much. And also it's one of those things that, if I'm going into this building to study and it's 3 in the morning and no one else is here, there's 4 lights that are being turned on, the hallway light, the room light, the desk light, and whatever I plug my computer into, you know. Whereas if I just go into the library with everyone else, what is the energy trade off? You know. So I think it would be cool to know, the building cost, but also energy trade off. I feel like this was a really cool website, cool to see stuff, but I think at the same time, it was not informative to me to change my behavior. It was weird to see that that dollar amount was being spent on energy, but at the same time, there wasn't anything given to me in textual information about what I can do.

END OF POST TEST INTERVIEW

Participant: AD05
Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

AD05: So I'm on question one...

AD05: I'm looking at the homepage. Not too complicated really. I'm not sure if I like the red and the green really. But maybe that is just my personal color preference. The icons, I know they fit with the webpage but they are a little corny, maybe. But they definitely tell you what you need to know, I think.

AD05: So question number one. So I guess I will go to electrical and... This page looks a little severe. The red and the black, I don't know if I like that. I guess I will click on today. It is nice that when you hover over the bars it tells you what the number is. I don't think I like the three dimensional bar because it makes it a bit hard to tell where the top of the bar is, either on the back or on the front. Oh but I guess I can scroll and see other times too! But lets see it looks like the energy consumption was highest at 1PM. It might be nice if I

could zoom out and see kind of the overall of the whole day. Looks like it is still 1pm.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

AD05: Okay. Moving on to question two...

AD05: So I will look at this week I think. Today is the 24th. Looks like energy consumption has increased compared to yesterday. That was pretty easy to figure out.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

AD05: Moving on to question three...

AD05: It sounds like I am going to move away from the electricity trends; even through it would be cool to look at. So chilled water...chilled water. I think it was pretty clear finding that icon. Although, I think it is a little bit confusing. There is a lot going at the bottom of that screen: the scrolling, the writing and a black bar. The black bar makes it seem like the grey bar with all the icons is separate from the black. So for example, (the phrase) electrical energy...*electrical* in the grey looks like it is separate from the *energy* in the black. It says that pretty clearly at the top, although I was initially looking at the bars. So 63 tons. So now how to convert that to dollars? We are going to try unit equivalents maybe. Click on dollars. Equivalent of 95.38 dollars. So that wasn't too hard although there are a lot of different menu's I could have gone to and different buttons.

4. Which month of the year presented the highest demand for cooling (chilled water tons)?

Transcription:

AD05: Moving on to question four...

AD05: So I am going to go to this year. And the graph makes it pretty clear that it is April that has the highest demand. Okay.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

AD05: Moving on to question five...

AD05: So heating. So as I said before, as I continue on this website I really feel that the scrolling bar on the bottom is really obnoxious really. Especially since it gets really busy at the bottom of the screen. And actually the background with the little green streaks also gets in the way. I am more of a fan of a kind of a clean-cut very simple look. Also, I think it is unnecessary that it repeats the *today's maximum demand* it is at the top and at the right hand side of the screen. I don't think that is necessary. It just makes things busier. So which day of the month? Again I would like to be able to zoom out, I'm not sure that I can do that. But the more solid horizontal lines help differentiate between the days. But again, the three dimensional bars aren't my favorite. So I guess April 2nd.

6. The following are unique energy conservation features present in the Human Ecology Building:

Circle all that apply:

daylight harvesting,	reflective roofing	habitat restoration	supervised indoor air quality	lake source cooling
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Transcription:

AD05: Moving on to question six...

AD05: So, that question is a little more complicated I think. So I am going to try compare maybe. So I am comparing dorms. So electricity. Um that doesn't look like it is right. Um. Try total energy, maybe. I'm not sure how get away from the Human Ecology Building to maybe the dormitory. Let me try going to home. Nope. I guess that is what the help function is for.

AD05: Referring to green facts...this is kind of cool how it reads like a book but it might be easier if you could skip around instead of having to go through each term separately. It talks about lake source cooling. Yeah it might be nice if they separated this so that if I wanted to learn about lake source cooling because right now I don't know how long these sections are ... it kind of seems like a random compilation of information. This table I guess gets a little cut off. It is not too bad but I guess this isn't the right place.

AD05: So it is pretty clear on here that daylight harvesting is one. Reflective roofing is one. Habitat restoration is one. Go to the next page. Supervised indoor air quality and it talks about lake source cooling.

7. Second floor plug load energy consumption was lowest at what time today?_ AM/ PM

Transcription:

AD05: Moving on to question seven...

AD05: So go to maybe electrical energy. And lets see if I pick a section of the building. It would be nice if I could see the whole menu without having to scroll. The one thing that bothers me the most is having to scroll left and right a lot. It would also be nice if you could zoom. Second floor plug load energy consumption. So I click on that. The lowest point. Lets see 4 AM is 8.7. So it looks like the lowest point today was at 4 AM.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

Moving on to question eight...

AD05: This website, definitely the intent is to make more public information about daily energy use and increase understanding. I suppose I could go to the homepage where it probably tells me the mission. Okay. So the mission according to the website is ... (she reads the entire first paragraph of the website). Going on what I said before, to increase understanding in order to increase behavior and to improve decision-making and in order to help assess building performance.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

AD05: Moving on to question nine...

AD05: So maybe the scrolling bar at the bottom seemed to have some facts last time I looked at it. Um... Turn off your home office equipment when not in use. So tips scrolling around on bottom of the screen. I think instead of having the scrolling bar I would have a section that says how can I reduce my energy use. That answers the question, how can I reduce my energy use or water use. So that they could go to the link and see, oh this is how I could improve and see instead of having to wait for the scrolling bar. I imagine there might be other resources. It is actually surprising how little there is of that. I think it would be cool to have more of that. More tips. More helpful ways to conserve energy. Obviously you could just look (from) day to day to see how to conserve energy but I think mainly just the tips are all I am seeing.

END OF TASK ANALYSIS

Participant: AD05
Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

AD05: Um, I would say, I would say neutral, I don't think they're ugly necessarily, um, compared to a lot of webpages I've seen, it looks a lot crisper than webpages I've seen, but I also think there's room for improvement. Maybe with the color, and maybe with reducing clutter, making everything a little simpler.

2. The layout of the website is well organized.

AD05: Um, yea, I think other than the tips, scrolling along the bottom. I think the organization by type of energy is useful, and then other resources are organized well. So I would say 2 agree.

3. This website has appropriate use of color.

AD05: Definitely color isn't overdone, which is nice. The same color theme is kept. Um, as I said before, I'm not a fan of the colors necessarily. They're visually pleasing colors combined, maybe a little severe at times. So, I guess I'll say neutral on that one.

4. The pages on the website are visually consistent.

AD05: Yeah, I mean, so for the different types of energy, cooling, heating, electrical, the pages are definitely consistent. And they do change for the other pages, but I don't think I would expect them to remain consistent. So yeah, I would say strongly agree on that one.

5. In general, it's a good balance between graphical and textual information.

AD05: Yeah, I think it's very visual, which I think is really nice for most people. Um, there are definitely paragraphs of writing. The section where I saw the most writing was probably the facts and definitions, and that was only a few short pages with brief definitions. So I definitely think, a good balance, strongly agree.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

AD05: So I'm guessing I'm not sure what that question's asking. But I'm guessing its like um, if your on the electrical energy page and you want to change the units, or look at equivalence, or you want to change what part of the building you're looking at. Those are consistent across all the pages. So, I strongly agree with that. I don't know if I have any comments on that.

7. Remembering where I am on this website is easy.

AD05: Yeah, I would definitely agree with that, there's no maze, there's no problem getting back from where you've gone because each possible page is clearly shown below with the icons. And you can easily get back to where you were. So I would strongly agree with that.

8. The organization of the menu on each page is quite logical.

AD05: Um, I don't think there's anything illogical about it. I think I mentioned before the repeated iteration about the maximum demand wasn't really necessary, but yea, I think its fairly logical. I'd say 2 I agree with that.

9. Few mouse clicks are needed to find a given piece of information on this site.

AD05: Yea, I think I would agree with that. Um, you can go directly to choose a day, month, you can easily choose a unit, you can easily choose a part of the building. Um, so I would strongly agree with that.

10. I am engaged when using the website.

AD05: Um, I guess there's nothing, I think you would have to be really interested in energy use or water use to want to stay on this website, and look at the data more. I don't think there are, I don't think there is anything particularly drawing for people who aren't interested in it. Um, I don't know that anything should be added to draw people in. But um, so I'm not *not* engaged...but it's not a website that I would necessarily have fun on. So, I'm going to say neutral for that one.

III. Content

11. I understood the purpose of this website.

AD05: Yeah, I definitely agree with that. Quite clear the purpose, and the purpose is stated at the beginning. So yea, I'll explain that the purpose of the website was clearly stated on the homepage.

12. The information I found meets my needs.

AD05: For the purpose of answering the questions, I think it answered all the questions I was supposed to answer. So yeah, I think it met my needs. Um, for the most part. Maybe not in the case for wanting to know how I can improve my energy. What are ways I can make a difference? So, I'll say neutral on that one. And I'll kind of say that I would like to have more information about how to improve energy use, personal energy use.

13. I felt information presented by this website is meant for a more technical audience.

AD05: Um, I mean, back to what I was talking about with engagement. Definitely, you would have to be interested in order to be engaged. So a tiny bit, I mean it's some of the terms are not clear although they might be in the definition section, like plug load, or receptacles. People might not know what that's talking about, air enthalpy, maybe if the definition popped up when you hovered over it, or if there's a little question mark you can click on, that might make it easier, so that people wouldn't have to go to the facts and definitions section. That might make it a little more user friendly. Um, so I think it's useable by both parties, but yeah, I guess I would agree that its meant for a little more technical audience. For explanation I'll say some terms were unfamiliar.

14. I find it was difficult to relate to the energy units presented.

AD05: Um, watts, kW, I think if you want it would convert it to dollars, which is nice. It tells you about hairdryer user...which is an easy thing to compare to. So no,

I don't think I found it difficult to relate to other units present. So I'll say 4 disagree.

IV. Usefulness

15. I found this website useful.

AD05: Yeah, I really agree with that. I think its nice to know about energy use in buildings, I think that's information that would be hard to obtain otherwise. So, yea, I think it's very useful.

16. I would use this website on a routine basis.

AD05: Probably not for the Human Ecology building, but for my residence, I would certainly look at that, maybe once a month I would look at it probably. You can see general trends a little easier. Day-by-day is hard to see trends. Unless there was a certain occasion where I thought energy use was higher or lower than usual, I would want to see it actually made a difference if we had an event where we tried to reduce energy. It would be cool to look at whether energy actually was reduced.

17. Identify one energy-conservation tip provided by this website:

AD05: Turn off office or home office equipment when not in use.

18. Please identify the feature of this website you found most useful:

AD05: Hmm, I guess I would say the comparison by day, month, building section. I thought that was neat to be able to compare things. I think comparison, in general, always helpful. Because energy might be high, but you compare it something else that is higher, then you know the difference

19. Please identify the feature of this website you found least useful:

AD05: Um, probably the features I didn't understand. You know if you don't understand it, then it's not useful, if they were to make it easily understandable where I didn't have to make an effort to understand it, then that would be helpful.

END OF POST TEST INTERVIEW

Participant: AD06

Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

AD06: So I stayed on the electricity page and it said at the top very clearly that today's maximum demand for electricity for the entire building demand is

255.47KW. That was very clear. It also says it at the right side. I don't know if it is necessary on the top and on the side but it made it very clear.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

AD06: Um... I guess you enter the date of yesterday or go to last 24hrs. So I went to today. There was no button for yesterday. That might make it a little easier. I am going to click on the calendar and enter the date. I noticed that when I clicked on the calendar, it was so low on the screen that I couldn't quite click on the right date but it is very hard. So then I did hourly and found that ... I'm not exactly sure how to find it. Oh! If you go back to today it has a left arrow. But it doesn't allow you to go into yesterday. But on the right hand side it has a green arrow. I didn't notice it right away. It is sort of dark on the right-hand side with the dark red and black. It might be easier if that were in a brighter color to say, these are the important things you need to know. For the answer to number two... Today's electricity consumption has increased .91% compared to yesterday.

AD06: Moving on to question number three.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

AD06: So I see at the bottom there is a circle that says cooling chilled water. I guess you might want to do I don't know, it doesn't look particularly cold. So you might want to do snowflakes near water or something like that. Since for the last question, since the big numbers that we need to know are on the right hand side I am going to look for the units on the right side... I guess I'm going to click on unit equivalent to convert to money. The icons are pretty blurry. Maybe you could get a higher quality image for these but I mean it is very easy to understand. Um. So lets see. I clicked on the equivalent and it says that it is the equivalent of 35.41 dollars. Maybe you should have a section on the right hand side that is a little more prominent that says useful conversion tools so that people know that this is where to analyze some of the data better.

4. Which month of the year presented the highest demand for cooling (chilled water tons)? _

Transcription:

AD06: So I guess I will click on this year under chilled water trends. This year... I would say that the answer is April. I'm not sure what the green line is for... Oh! Dollars! Oh ok so to see dollars, you touch that [green line]. But it's not in the units... So was it 16.98 dollar for all of April or is it cumulative? I'm not

sure if it is for the whole month but I don't think that it really matters for the question. I don't know. I don't understand. So which month... so April!

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

AD06: So I'm going to click on heating, steam. So for the heating icon it is fire but we are talking about steam. I'm not sure if there is something better for that. So I clicked on heating. I clicked on steam. So this month's maximum demand is 2.86 and it is down 37.66%. It is nice to be able to scroll down the bar graph just to look at all the different bars and to try and find the day when it was 2.86. And it was April 2nd. it would have been nice if on the right side it said the highest amount and corresponding date. Oh! I see on the left and notice that it was steamed demand and steam consumption. I guess I will go back to electrical energy. Oh I'm just very, very confused as to how heating demand and consumption differ. It is very tricky to figure out when it was highest. OKAY. Well, I guess I can't go back so I will just keep going.

6.The following are unique energy conservation features present in the Human Ecology Building:

Circle all that apply:

daylight harvesting,	reflective roofing	habitat restoration	supervised indoor air quality	lake source cooling
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Transcription:

AD06: Report. Floor plan. Facts & definitions. I do not know. I guess I could click on learn more on the home page... building details. I don't know. I guess I can use the search tool for reflective... So I guess I can go to total energy and try and see. Back to home. Back to learn more. So it says under building details... like half the thing is filled up... it says nothing about reflective roofing or habitat restoration. Facts & definitions. Green facts. Okay. Here it is. Reflective roofing. Habitat restoration. Yes. Lake source cooling. So all of them. That was really hard to find under facts and definitions. I think this would be really cool to have it on the front page to say that this is what Human Ecology does.

7. Second floor plug load energy consumption was lowest at what time today?_ AM/ PM

Transcription:

AD06: Plug load...consumption...lowest at what time today? So I went to electricity. I went to plug load consumption as opposed to demand. So maybe they should define or help people understand that they could go to that side and click through all the different options. Plug load was lowest at what time today? So I'm going to go to ... 10am was at 0.1. So maybe you could have a lowest and a highest so that people could understand the range. So I will do 10am.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

AD06: To help students understand and access sustainability information.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

AD06: Conserve energy. Well it would remind me to be conscious of energy consumption and yeah I think that just scrolling through the tabs or even just seeing it is pretty cool. You can just browse through to see trends if it is hot outside are we consuming more of this or is there a higher demand of this. Yeah. Okay. I think I am done.

END OF TASK ANALYSIS

Participant: AD06

Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

AD06: I would say 4 disagree, they were very hard to navigate and often I wasn't exactly sure the purpose of the page. The icons were ok, but other than that, there wasn't any particular aesthetic to the pages.

2. The layout of the website is well organized.

AD06: I'd also say 4. Although there is a dashboard, it is a little bit difficult to understand what the icons mean, like why some things are in the black part of it, I don't know, I just got a little confused.

3. This website has appropriate use of color.

AD06: I would say 4 just because it was a lot of reds and blacks, and typically when you think of sustainability it's lighter colors, like green and blue and white. So maybe you can make it a little lighter feeling.

4. The pages on the website are visually consistent.

AD06: Let me check, I would say 3. Some of them were similar, whereas the facts and definitions was very different than the other page.

5. In general, it's a good balance between graphical and textual information.

AD06: I would say 2 for the most part. Some pages like the first page, there's a lot of words. Other times it's mostly graphs.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

AD06: I would agree with that, they were necessarily that user friendly, but there were pretty consistent. How can it be improved... like less words, important buttons at top, or highlighted in a specific color. When I got on each page I wasn't sure where I was supposed to look, so I just starred at the graph. And I was drawn away from looking at the edges, which is why I missed scrolling down, demand, and consumption, units of equivalence for today's consumption. Maybe it could be more graphical and draw the eye to where the first stack, which is on the left side, demand and consumption, figuring out what you're looking at.

7. Remembering where I am on this website is easy.

AD06: Yeah, I would agree. It was, you know the title "heating steam," in the heating steam icon.

8. The organization of the menu on each page is quite logical.

AD06: I would say 5, I didn't actually notice a menu on each page. It seemed like there was just a bunch of options, and not one centralized menu, which we might do at the top. It could be like, first click "steamed demand," or "steamed

consumption,” then click the day, the hour, this week, month, or the year. And then you can do all these different comparisons.

9. Few mouse clicks are needed to find a given piece of information on this site.

AD06: I would say 5, it took a lot of trial-and-error. Maybe you could put the facts and definitions more integrated into the homepage.

10. I am engaged when using the website.

AD06: I would say neutral, at times I’m really engaged looking for an answer for one of my questions. Other times it’s a little frustrating, so I become less motivated.

III. Content

11. I understood the purpose of this website.

AD06: I would say I’m neutral. I get the purpose, but I’m not exactly sure what all the pages are for. Like I’m not sure what people would use these for.

12. The information I found meets my needs.

AD06: I would say disagree, it was very technical information, maybe you could like have a little box on each page that says like a summary of the days information in regular terms. Less technical. You could do more graphical stuff, instead of just a bar graph you could use a graph, like a tree, something just to explain, like to compare the days and months and stuff.

13. I felt information presented by this website is meant for a more technical audience.

AD06: I’d say 1 I strongly agree. I’d say it’s more for people who are in Human Ecology who understand words like steamed demand and steamed consumption, and building baseline, all the units.

14. I find it was difficult to relate to the energy units presented.

AD06: Strongly agree. I just don’t know what they are.

IV. Usefulness

15. I found this website useful.

AD06: I would say I’m neutral. It was useful to an extent, a lot of it I didn’t really get. I like the part on the right hand side, it just says “compared to yesterday” and you should have that, “compared to last month” too, like this month compared to last month.

16. I would use this website on a routine basis.

AD06: Probably once a semester, or never. I don’t know if I necessarily benefit from it at all, other than getting a better understanding of what’s going on campus,

and maybe there could a page about green initiatives, or like suggestions for how you could be more green. 'Cause then I would use it more if it said like, you know small adjustments you could make in your everyday routine.

17. Identify one energy-conservation tip provided by this website:

AD06: I don't think they gave tips, but under facts and definitions I remember reading about all the other things like reflective roofing, daylight harvesting, so I guess I could say, reflective roofing equals less hot building.

18. Please identify the feature of this website you found most useful:

AD06: Would be I guess the home page, the facts that you put on the facts and definitions were pretty helpful, but I don't understand why it was in the little story book form. Um, I'd say the homepage.

19. Please identify the feature of this website you found least useful:

AD06: The graphs.

I01: Do you have any general comments about the website?

AD06: Sure, yeah. I thought it was an awesome idea, I think a lot of students would love to see energy consumption and sustainability, but I think people who aren't familiar with the technical information, more like graphical representation, so maybe you could have, like a picture of the building or something, and then in very general terms it could say.. 'cause I didn't know the difference between "steamed demand" and "steamed consumption." So maybe you could just have a page for people and say "this much water, these many gallons were consumed today, or this much energy was consumed today, these are some tips you can do in your everyday life. 'Cause I started to understand it a little bit, but when you go into this page (electrical energy), I was really drawn to the graph 'cause it's like right there in the center, but I totally didn't realize that there were all these different things to click through (left sliding bar), and I wasn't really familiar. So this is a really good place for more technical people to come, but I liked how you had this here (triangle on right hand side), this is just what you need to know. And maybe you can compare buildings, or is this just for the Human Ecology Building?

I01: This is just for the Human Ecology Building.

AD06: I like how you compared the floors. That was cool. Yeah, I think it's really, really interesting and a really good start. I've never seen anything like this before.

I01: Was there anything that you felt was, that you struggled with? Like the graphics for example...parts of it that were difficult to navigate?

AD06: Yeah, well at first I didn't get the icons, just on a very basic level, but then I kind of got it had the words. When I clicked into it (electrical energy), I understood the graph, but I mean, I just didn't get how to use it at first, like I would see the graph and the title of the page is "electrical energy," but this is "electricity trends." But I don't know...

I01: So redundancy?

AD06: Yeah

I01: And, what do you think about the options like "today," that part

AD06: I love that part, that was a great function of the website because it reminded me a lot of the weather website where you can look at today, or a month, or a year, and see those trends. So I don't know maybe if you want to go into weather.com, it's similar to this where they'll show you graphs and trends of the weather, and that, well I know it's not the same thing, but it's very easy to see.

I01: Yeah, I think that's true. And it simplifies it. So weather is something that we can all inherently relate to versus energy, so I guess my question is did you feel this website is effective in helping you relate to energy, and if not, how could it do that?

AD06: I think starting on the home page, and having some.. so if I just wanted to come here, I could scroll through all these icons, but maybe something that you say on here, like a graphic that you have on the homepage will be like "oh yeah, like water consumption, let me go check that out." Maybe you could do that 'cause you could sit here for 30 minutes and look through all of these, but maybe just people want to come and see news, what the most recent sustainability initiative was, or like the floor that was most sustainable combined. Or which area you're reforming the most, which area you've been the best in. I wasn't sure what this was (report icon) I didn't look at it, oh, I'm not sure what that is. Yeah, it was really cool. I liked the dollar conversion part. That was interesting to see.

I01: Easier maybe to relate to right?

AD06: Yeah, exactly.

END OF POST TEST INTERVIEW

Participant: AD07
Transcription: Task Analysis

START OF TASK ANALYSIS

**1. At what time was electricity consumption (kW) highest so far today? _ AM/
PM**

Transcription

AD07: Okay. Should I read the question out loud? Okay. So I'm on the website and I'm trying to find at what time electricity consumption was the highest. So I see the bottom all of these different things and I am going to click on electrical energy. Um. Okay so I think that the thing at the bottom with all the different tabs is kind of a weird place to have it. But I like that the pictures match their titles. I also think that the font doesn't really stand out very well. But I see that electricity consumption was highest today at 1pm. Okay.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

AD07: Moving on to the next question...

AD07: So clicked on today. I will look at this week. So, this is a nice graph. I think that there are a lot of options on the side. It feels a little overwhelming. The amount of options you can choose especially since I don't know what I'm supposed to be looking at. But it seems that the electricity consumption has decreased compared to yesterday.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

AD07: Okay. Moving on to the next question...

AD07: So I'm going to go to the bottom to cooling chilled water. That seems right. Um. Maximum demand. Okay so I see that the option for demand is on the side. I think that is good. I like the little green arrow on the side, which seems helpful. I like that it is green because it pops out. So clicking on today. Oh, I see it on the side. So today's maximum demand is 20.65 tons. So how do you convert it to dollars? Hmm. It's not very easy to find where it is in dollars. Oh there is a compare tab. Hmm nope that's not right. Yeah, that is not right. Try current demand maybe. So I went to current demand and I'm looking for how it is equivalent in dollars. I'm having some trouble finding it because I can only find chilled water demand in tons. Oh unit equivalent. Here we go, in dollars. Oh I see. Okay. Great. So today's maximum demand so I see the highest point was today at 10 o'clock. And that is the equivalent of 43 dollars and 75 cents. So that's the answer. That was kind of difficult to find that conversion. I think that the equivalent calculator.. It is just a lot to look at. I just think it should be with the main bar on the left hand side because it seems more logical to have that with the other options.

4. Which month of the year presented the highest demand for cooling (chilled water tons)?

Transcription:

AD07: I see the tabs at the bottom where it says months. Oh it says this year. So looking at the months this year. April is by far the highest; it has the highest demand for chilled water. That was pretty easy to find. I like the options at the bottom of the graph that was pretty easy to find.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

AD07: So at the bottom, heating system. So I'm looking for demand. So it is already selected for demand. Oh wait, which day of the month was heating consumption highest so far this month? So I'm going to click on consumption. So I'm going to click on this month. I think that was pretty well laid out. This month... let see... scrolling back toward the beginning of the month I see that highest day was April 2nd consumption of 23.84. That was pretty easy to navigate. Um. I do like the graphics when you hover over it...how it tells you what the consumption was. I think it is very user friendly.

6. The following are unique energy conservation features present in the Human Ecology Building:

Circle all that apply:

daylight harvesting,	reflective roofing	habitat restoration	supervised indoor air quality	lake source cooling
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Transcription:

AD07: Unique. So looking at the bottom. I'm going to click on report. Maybe that's where it will be. No that is not where it will be. Let me click on total energy. No that is not the right thing. Facts and definitions. No. Let me go to the home screen. No not helpful. Going back to the green facts. Oh here we go. Let me click the play button. Building facts. Okay. Great. So daylight harvesting... I like that the subject about what it is talking about [most important text] is in a different color. I think it provides good skim value. So I see that daylight harvesting, reflective roofing, habitat restoration, supervised indoor air quality and lake source cooling. I think that when you get to the facts and definitions page... how it doesn't default to the main page of the facts I thought that I was in the wrong place. Some suggestions would be to maybe fix that the play and the stop button...it could be brighter...or maybe it could just be programmed to default to into starting on the first page. But the design and the content of the book look good.

7. Second floor plug load energy consumption was lowest at what time today?_ AM/ PM

Transcription:

AD07: Moving on to the seventh question...

AD07: I'm going to go to total energy because I don't know what plug load means. It's loading. Um lets see. Hmm. In terms of the general design of the website. I don't. I like the... It looks good in the sense that it has the Cornell logo at the top but it looks very cluttered. It is not very intuitive as to where you should be going. I'm looking for this plug load energy and I am not really sure where it would be. But lets see, I'll try electrical energy. So I'll try the scroll bar... Oh here it is plug load. So I like the scroll down list but I still think that it is kind of cluttered there's just a lot going on. It could be sleeker by putting all of the menus in one place instead of having the split-screen where you have the menu on the bottom and the left and the right which is just kind of a lot. So plug load consumption. Okay clicking on that. Today. Okay. I think that it would be easier if it had max and mins so you could just find that easier instead of having to scroll through. I think the scrolling through is pretty user friendly but say that it seems the 2 am seems to be the lowest but then you have to scroll over to the other side because you can't see the whole graph. You could pick those out a lot faster that way. So it says 9.. oh what *time* was the question. So 2am.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

AD07: Moving on to the next question...

AD07: While looking at the website it seems that you are trying to show how energy efficient this new building is while giving a report. On the demand how much energy you use like water and everything. However, I'm not sure if that's the purpose of the website if it is just purely educational or is this for the university reports or something? Um... so to describe how energy-efficient this building is.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

AD07: Moving on to the next question... number nine.

AD07: Well, by looking at the website you can see when there is more demand and when there is the most consumption. So you can maybe see why... see if there are trends as to when there is going to be the most energy being used and how you can maybe curb energy use during that time and maybe shift things to when there is less energy being used. I'm not totally sure because it seems that this website is more report-generating than um, suggestion giving. Um. Okay.

END OF TASK ANALYSIS

Participant: AD07
Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

AD07: Um, I would say I am kind of neutral. I think it looks ok, but because you have the Cornell logo, at the top with Cornell's font and everything, it's not consistent throughout. And it also just seems a little bit cluttered, so I think it looks ok, but I think it could be better in terms of font and having a consistent format, and maybe a little more streamlined format.

2. The layout of the website is well organized.

AD07: Um, yeah, I'm gonna say agree because it is organized, but I think it can be improved by maybe making only one, like one option thing on the left and on the right, having, instead of having options, having outputs there, on the left hand side you can select stuff and see the graph in the middle and then on the right it would just pull the main data from it, so you wouldn't have to click anything over there, it just seems like a lot of menus surrounding it.

3. This website has appropriate use of color.

AD07: Um, I'm gonna agree, the red is consistent throughout, and it makes the other colors, like the green like pop out. But even still I think maybe more things could be highlighted.

4. The pages on the website are visually consistent.

AD07: Strongly agree, they all follow the same design.

5. In general, it's a good balance between graphical and textual information.

AD07: Um, yeah, agree, I think it's a really good balance between the graphs and the text. Although on the facts and definitions it was a little text heavy.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

AD07: Um, yeah, I agree that it was consistent, but I think that it could have been a little more, it was consistent, but it wasn't consistently easy across every page, so I think the layout could have been better done. So how could it be improved, options all on left side.

7. Remembering where I am on this website is easy.

AD07: Yeah, I agree, it was easy to tell. One thing that might be easier though, if when you, say... If you click on electricity trends, you could have like a box around the menu at the bottom, so when you're on electrical energy, or whichever tab, that maybe the font is a different color, it's in a box, so that you know that's the one you're on.

8. The organization of the menu on each page is quite logical.

AD07: Um, yeah, I think it's pretty logical, I like that the help is on the left, right hand side, and everything else seems pretty logical. So strongly agree.

9. Few mouse clicks are needed to find a given piece of information on this site.

AD07: Um, strongly agree, I found everything pretty simply, except when I didn't really know, when I was looking for the building plug load, I didn't know under what category that would be. So all in all, I found it eventually, so it's fine.

10. I am engaged when using the website.

AD07: Um, I would agree, it seems pretty engaging. I think the graph makes it easier to understand.

III. Content

11. I understood the purpose of this website.

AD07: Agree, or strongly agree it's clear that the website shows energy efficientness [/efficiency/] of the building, um, this is actually something I'm just noticing now, I'll just say it. The news feed scrolling across the bottom, I don't think it's super necessary because I think people are trained to kind of block that out, like I didn't read that at all throughout the entire time I was on the website, so if that's an important thing, to be there, I just don't think it adds much value and it makes the website look more cluttered. Like I'm reading it now, and it seems like it should be stuff that's under facts and definitions.

12. The information I found meets my needs.

AD07: Strongly agree, I could answer every question.

13. I felt information presented by this website is meant for a more technical audience.

AD07: I'll say agree because like I said there were some things that I didn't know exactly what I was looking for and where to find it. But all in all, it's pretty easy to understand like if you don't have any engineering background, or org background. So some things I didn't know, but all in all it was fine.

14. I find it was difficult to relate to the energy units presented.

AD07: Um, I'm gonna strongly agree with that because just looking at this in kW/h, I know what it stands for, but I don't know if that's a lot or not a lot when you compare it to other buildings. Like I guess there's a compare button, and I'm assuming that compare would show that, but just from the face value, I didn't really know. And it also took me a long time to find out how to convert it, like the unit equivalent button, maybe that could be a different color, it's just hard to find, especially being on the left hand side when I defaulted to looking on the left for the options.

IV. Usefulness

15. I found this website useful.

AD07: Strongly agree, it just seems like a cool way to show energy consumption.

16. I would use this website on a routine basis.

AD07: Um, I'm going to go ahead and say never because although, like me personally, I don't think I would ever use this website because although it is interesting, I'm not in the school of Human Ecology, I don't really care how much electricity this building is using. Maybe if I was in charge of Cornell's campus, and was on the universities' board of trustees, then I would use this, but as a student, I don't think it's super relevant to everyday life.

17. Identify one energy-conservation tip provided by this website:

AD07: Um, I didn't see any tips. Maybe that was on the bottom, that I didn't really look at. Yeah, I didn't see any tips. I guess they might have been in facts and definitions, like had a sign, an energy efficient building, but I kind of skimmed through that.

18. Please identify the feature of this website you found most useful:

AD07: Um, I liked the bar at the bottom, the navigation at the bottom. Um, I liked it because it is easy to find what you're looking for, the pictures make it pretty user friendly, and it was consistent throughout the entire thing. It could be better if, the one you're on was highlighted, but all in all, I liked it.

19. Please identify the feature of this website you found least useful:

AD07: Um, I didn't like the right hand column. Just seemed, oh, actually no. The feature of this website I found least useful, the newsfeed at the bottom. I just kind of tuned it out. I didn't read it. It added a whole lot of clutter. And if that was really important information, I don't think that's the best way to be displayed.

I01: now I'm going to ask you if you have any general comments about the website, and how you think it might apply to students, how it could be changed so that students, I don't know what major you are..

AD07: Hotel school

I01: How do you think it could be used by students, or become more applicable? How do you think it would be used well?

AD07: I just, I don't know if like the everyday student would use this website 'cause I don't know how much people care how much energy is being used by a particular building, I think if it had more general things, like the whole university, like if you had every building individually, like you could see this building, compared to like Statler Hotel which is really old, probably uses way more energy than this building...and like having that comparison might be

helpful, or comparing it to the whole university, or the whole university's footprint. But like, I don't know how, I don't know if you would use this all the time, I don't think you're going to wake up in the morning and check. See how much energy was used yesterday.

I01: Right, and in order for it to be something that you would be more interested in, what kind of features, qualities would it have to embody?

AD07: I think that it's almost like a cultural like shift. You'd have to like really publicize it to the entire university. Maybe have a competition with other universities to see which university can use the least amount of energy, and like the smallest carbon footprint. And then maybe people would be more engaged. But I think as it is today, I think, maybe it's just because I'm not in the school, I don't know, but yeah.

I01: If there were an aspect of this that was relevant to your courses, do you think that would it be something that...

AD07: Yeah, I think that if it was something relevant to your class, like your courses, I think you would definitely look at it.

I01: Ok, do you have any general feedback?

AD07: I don't like this

I01: You don't like it? You had a really hard time finding it?

AD07: Uh, the website, oh, I just mean this, the scroll thing at the bottom. I just didn't read it. I don't know.

I01: You didn't notice it?

AD07: Well, I guess I just kind of tuned it out while I was doing the questions, and once I realized it was there, it really kind of bothered me because it just seems kind of cluttered. If it's important, I don't think people are going to sit there and read it, I don't know.

I01: So if there were an aspect of this that could tell you about your personal impact, do you think that it might be a little more relevant?

AD07: Yeah, I think so, because I don't think you have, yeah, I think that if you can see your own impact that would be a lot better because the whole building as a whole.

I01: Even if it were just an educational tool, do you think, if there was an educational tool that taught you about sustainability, in general, as it pertains to your major...

AD07: Yeah, I think that would be nice.

END OF POST TEST INTERVIEW

Participant: AD08
Transcription: Task Analysis

START OF TASK ANALYSIS

1. At what time was electricity consumption (kW) highest so far today? _ AM/PM

Transcription:

AD08: I really like the layout and graphics of this first page. It is not too cluttered and the text is very easy to read. I like the symbols at the bottom of the page that take the place of tabs. I like that. It would be great if the symbols at the bottom were highlighted so that I know where I am on the site. So, to answer the question number one... It is easy I guess it to know where to go because there is an electrical symbol. Okay. Looking at this next page there is a chart and I think the chart is pretty easy to read but I think the things to left and the right of the page are pretty distracting. The running text on the bottom is kind of distracting as well. To answer the question I am looking at electricity consumption in kilowatts and when it was highest so far today. So the answer is right here on the right hand side. Which is good because I was trying to figure out which of the bars where higher. Two of them seemed to be kind of the same so it is good that there is a written answer on the side. Oh, okay.... so looking at the answer it should be 3pm. And like I said the text is easy to read. However, the background of the chart is pretty distracting.

2. Today's electricity consumption (kW) has _ compared to yesterday?

Circle one:

Increased	Not changed	Decreased
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Transcription:

AD08: I am finished answering the first question and I will now move on to answering the second question...And also this is very easy to figure out. On the right hand side of the website is ... I am now finished answering question number two.

3. Today's maximum demand for cooling (chilled water tons) is equivalent to _ dollars.

Transcription:

AD08: So now I am going to click on the symbol for cooling which is very easy to find at the bottom of the page. This page is very similar to the page before in that the chart is very easy to read and simple.

I01: Are there any comments about the aesthetics and the website overall?

AD08: I guess if I tried to define the purpose of the website. I guess it would be just to find out how much is used of everything in the building. I guess it would be

good to have a purpose statement at the beginning of the website to kind of signify why people would want to know about this information or why anyone would care about this information. I personally am not a Human Ecology major so it is not really that relevant to me. But maybe in terms of relating it to something else on campus or other buildings or something that might be beneficial.

AD08: So in answering the third question... having a little more trouble finding the answer to this one. Demand from tons into dollars, I don't really know where I could do that. Okay. So I clicked on the unit equivalents button. It wasn't really clear that it was a button. It popped up that it was an equivalent...the answer is pretty clear. It was very hard for me to find that button and to figure out the equivalents. So maybe some sort of note or something that says finding the equivalent in terms of money or footprint is possible.

4. Which month of the year presented the highest demand for cooling (chilled water tons)?

Transcription:

AD08: Again, I'm on the same page and to answer this question. I'm clicking on the button that says this year, which is pretty clear and is shows all the months up to date. Graph is still easy to read. I'm not sure about the red title text on top of the green background. To answer this question it was pretty clear what I needed to do. Yeah the text on the page is very easy to read and the design of it, I don't really care for the greenish background.

5. Which day of the month was heating (demand for steamed water MMBtu/hr) consumption highest so far this month?

Transcription:

AD08: I'm clicking on the heating steam, which was very easy to find because it says heating steam, and has a fire icon on it. The text is easy to read and it is easy to get to the page. To find out when heating and steam consumption were the highest it is pretty clear which button I need to click on it. I have to scroll over a little. It would be nice if there were a line-graph format. So April second. Okay. So that was fairly easy to navigate.

6. The following are unique energy conservation features present in the Human Ecology Building:

Circle all that apply:

daylight harvesting,	reflective roofing	habitat restoration	supervised indoor air quality	lake source cooling
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Transcription:

AD08: I am finished answering question five. I will move on to question six...

AD08: So the next section is about unique energy conservation features present in the Human Ecology Building. This one is a little more ambiguous about which icon I should choose. The fire represents water and the sphere represents water. So I am going to click on the floor plan... So I'm going to go ahead and click on the floor plan. I'm looking for unique energy conservation features. On this page there is in the center a brown drawing ... I'm guessing this represents the floor plan of the building. I'm not sure if this is where I would find my answer but if not I'm curious to see why you would need a floor plan tab on this website. I'm going to click view chart. I'm looking at the floor plan chart. It just says today's electrical energy consumption. The graph is easy to read, the background is not distracting. The colors kind of flow together with using the blue and red. The text is very easy to read. I'm not sure as to what the purpose of this graph is. So it looks like it is comparing second floor lighting consumption to second floor plug load consumption... I don't really know what that is or means... So I'm a little confused... So I'm just going to X-out ... I don't think I'm going to be able to find the answer to my question here. So I am going to click on the compare tab to see if that can lead me to something. So this page ... the graphs are easy to read. The colors work well together. It is pretty easy to see what the purpose of this website is... It seems that the point is to compare portions of the website to each other. Maybe I am going to go back to the homepage? The homepage is simple. There is a system goal. The pictures are nice. I'm going to click learn more to see if that can help me. So I am just looking at the building details and I am going to read it. This doesn't help me find the answer to the question either. Maybe I am going to click on... Facts & Definitions. I'm not sure if it what I want that clear to me or what but Facts & Definitions is where I'm going to find features of the building that help for energy conservation. Okay. So I'm just answering the question now. I like the interactive component... it looks like a book you are reading. I think it is a good interaction and the graphics on them are good. There is a section on the side that says videos but there doesn't seem to be a video. So maybe that can be taken out. So I'm not sure why that it there. Umm. I think this tab is probably the most useful just because it provides definitions for people such as myself that are not as knowledgeable about this topic. I think that knowing exactly what unique features of the building help with energy conservation is important. So I am now finished answering question six. I will now answer question seven.

7. Second floor plug load energy consumption was lowest at what time today?_AM/ PM

Transcription:

AD08: So I will go back to the floor plan tab just because I clicked on it previously. So looking at the second floor plan I'm a little confused as to what floor plug load is. Um yeah, I'm not really sure... (Participant re-reads question). So I'm clicking on the view chart to try and find the lowest total energy consumption

and looks like at 10am it was 0.1 so that was the lowest. Finished with question seven.

8. In the space below, please describe what you believe the mission of this website is:

Transcription:

AD08: To try to find the mission I assume it is going to be on the homepage. So it is a system goal. It doesn't explicitly say mission of the site but I am assuming that is what that means. I'm clicking on learn more to see if there was an actual mission on that link... but there wasn't so I went back to the homepage. "I think the mission is to influence environmental decisions on sustainability by providing real-time access to building performance data." Okay. I'm done with question eight.

9. In the space below, identify one way this website would help you conserve energy:

Transcription:

AD08: It took a little time to read the scrolling text at the bottom ... so I'm just going to answer the question. It says to turn off your home office equipment when not in use. Okay. So I'm finished answering nine.

END OF TASK ANALYSIS

Participant: AD08
Transcription: Post Test Interview

START OF POST TEST INTERVIEW

I. Aesthetics/ Graphics

1. The pages on this website are visually attractive.

AD08: I am going to agree for the most part. I don't really like the green and red, the background is green, and the majority of the text in borders is red, I think that's too much contrast. It's not really attractive to me. Otherwise I would strongly agree with the rest of the graphics and things on the website.

2. The layout of the website is well organized.

AD08: Um, I strongly agree I liked the use of the symbols for the different tabs. I think that was really easy and really clear for the most part, as to where, what tab was based on what by the symbols.

3. This website has appropriate use of color.

AD08: I'm just gonna put 4 disagree just because the reason I just said the green background, green lines, and the red borders, I don't think that contrast should have been used.

4. The pages on the website are visually consistent.

AD08: I strongly agree, it was very easy for me to find the answers on another page once I'd already been to a different page before that had the same layout. Because it helped me know where to look for answers.

5. In general, it's a good balance between graphical and textual information.

AD08: I'm gonna agree. Um, on the heating steam and cooling chilled water pages, I think the graphic on the left with the building made it a little more cluttered than it needed to be.

II. Navigation

6. I found organization of various functions of the website were consistent across pages.

AD08: I strongly agree. It was very easy to find things because of the consistency.

7. Remembering where I am on this website is easy.

AD08: I'm gonna agree, 'cause of the tabs. So most of the tabs were easy, and there was a lot of titles on the pages.

8. The organization of the menu on each page is quite logical.

AD08: I'm gonna just be neutral because I didn't find it particularly pleasing overall or disagree with it.

9. Few mouse clicks are needed to find a given piece of information on this site.

AD08: I'm gonna agree, it's pretty easy, everything is right there.

10. I am engaged when using the website.

AD08: I agree, changing the unit equivalence was interactive, and the facts and definitions page was very interactive.

III. Content

11. I understood the purpose of this website.

AD08: I agree, the mission, or system goal on the homepage was clear.

12. The information I found meets my needs.

AD08: The information helped me answer the questions, so I'm gonna agree.

13. I felt information presented by this website is meant for a more technical audience.

AD08: I'm gonna agree with the next question as well, because a lot of the stuff, the terms I wasn't very sure about and it seems like it was made for people who are interested in energy consumption and things like that, for the words that were used.

14. I find it was difficult to relate to the energy units presented.

AD08: I'm gonna, um, say agree just because, I think it should probably relate to energy units, probably in monetary or other things first, rather than kW or watts or tons because not many people know what that means.

IV. Usefulness

15. I found this website useful.

AD08: I'm gonna be neutral. It's useful for answering the questions, and this, and if I was interested in this, but yea, ok.

16. I would use this website on a routine basis.

AD08: Um, I'm gonna answer 5 for that, I'm not really interested in energy consumption, and I'm not a Human Ecology major, so I'm not going to use this website.

17. Identify one energy-conservation tip provided by this website:

AD08: To turn off office equipment.

18. Please identify the feature of this website you found most useful:

AD08: One feature I found useful were the symbols in place of tabs.

19. Please identify the feature of this website you found least useful:

AD08: The least useful, um, I guess would be the floor plan feature.

I01: I'd like to ask you some general questions, if you were to adapt this dashboard, to a space, what changes would you make? How could you make this a more attractive tool?

AD08: Um, I'm not sure. I mean I guess you could put it in a place where other people would maybe see it. The website itself is useful, but I don't know if I would seek out to use it. So maybe trying to put it on social media or something, I don't know, I'm not really sure. Increasing the visibility so that people know that there is something that does that, so maybe.

I01: Do you have any general comments?

AD08: Um, I think the website itself is cool, it seems very useful and it's interesting to see how much of each thing the building actually uses. It is pretty, I guess useful, easy for people who are like myself who aren't really familiar with energy consumption facts. It was interesting to view on the website so.

I01: Were there any features that you didn't see at first until you navigated through the website?

AD08: Uh, yeah, it was pretty easy to navigate. The only one that gave me trouble was the facts and definitions one, but yeah.

END OF POST TEST INTERVIEW

APPENDIX E: CRITERIA FOR OUTCOME MEASURES 01-04

A1. Outcome Measure Time

Purpose: Time is a quantitative measure of difficulty involved in finding a question. The longer the time, the more difficult the question is to find.

Criteria: Start time begins when the participant has fully read the question out-loud. Some participants do not fully read the question out-loud. In those instances, time begins when the participant actively begins to search for the solution. Time ends when a participant states (s)he has finished answering the question. If a stopping-point is not stated explicitly, time ends when a participant stops making comments specific to the question at hand and/or moves on to the next question. Participants are allowed to pause during the experiment to ask questions/clarification and this time is subtracted.

A2. Outcome Measure Mouse Clicks

Purpose: Number of “mouse-clicks” is a quantitative measure of difficulty involved in finding a question. The greater the number of mouse clicks, the more difficult the question is to find.

Criteria: A “mouse-click” behavior is recorded when a “clicking” sound is made. This behavior is apparent when the participant is trying to navigate from one section of the page to another.

A3. Outcome Measure ‘Successfully Completed’ Answers’

The ‘successfully completed’ answers to the task analysis were determined based on the steps outlined below.

A3.1 Lucid Dashboard Correct Answers

Task1: At what time was electricity consumption (kW) highest so far today?

Should go to the “*Human Ecology Building*” > go to “*Electricity*” > find highest point on graph.

Go to “*Comparisons Tab*”> set “*Custom Period*” OR “*Current 24 hrs*”

Task 2: Today's electricity consumption (kW) has__ compared to yesterday?

Stay under the “*Human Ecology Building*” > stay under “*Electricity*” > use “*Layers*” to compare to yesterday > OR go to “*Week*”

Stay under “*Comparisons Tab*”> stay under “*Electricity*” > “*Custom Period*” > select a time period for “*Previous 24 hrs.*” > select a time period for “*Current 24 hrs*”> compare both time periods.

Task 3: Today's maximum demand for cooling (chilled water tons) is equivalent to __ dollars.

Stay under “*Human Ecology Building*”> go to “*Cooling*”> select “*Unit Equivalent*”

Task 4: Which month of the year presented the highest demand for cooling (chilled water tons)?

Stay under “*Human Ecology Building*”> stay under “*Cooling*”> select “*Year*”

Stay under “*Comparisons Tab*”> stay under “*Cooling*” > “*Custom Period*” for each cumulative month NOT “HIGEST POINT”

Task 5: Which day of the month was heating (demand for steamed water MMBtu/hr consumption highest so far this month?

Stay under “*Human Ecology Building*”> stay under “*Heating*”> select “*Month*”

Stay under “*Comparisons Tab*”> stay under “*Heating*”>check “*Human Ecology*” > “*Custom Period*”> graph OR “*This Month*”> and find *highest point*.

Task 6: From Jan 1st to April 1st, how much electricity (kW/ person) did the highest energy consuming residential dormitory use per person?

Should go under “*Comparisons*” > “*Residence Hall Electricity*” > use the “*Custom Period*” bar at top Jan1st to April 1st > “*per person*” > find highest amount for the residential buildings

Task 7: Lake source cooling represents the following % reduction in energy use for campus cooling. __%

Should go under “*Sustainability Tab*”> click three times > find under “*Unique Features & Lake Source Cooling*” within paragraph-text.

Task 8: In the space below, please describe what you believe the mission of this website is.

Variable answer. It is noted whether the conservation tip is read from the website.

Task 9: In the space below, identify one way this website would help you conserve energy.

Variable answer. It is noted whether the conservation tip is read from the website.

A3.2: Alerton Energy Dashboard Correct Answers

Task 1: At what time was electricity consumption (kW) highest so far today?

Correct answer is found under "Electrical Energy tab" > "Entire Bldg. Consumption option" on the top lefthand corner> "Today or Last 24 hrs button" & scroll bar> >answer title "Maximum Demand

Task 2. Today's electricity consumption (kW) has__ compared to yesterday?

Remain under "*Electrical Energy tab*" > "*Entire Bldg. Consumption option*" on the top lefthand corner> view "*large arrow*" on top right hand corner >> OR select a "*custom period*">> OR select "week" & the "view last week tab"

Task 3. Today's maximum demand for cooling (chilled water tons) is equivalent to __ dollars.

Answer is found under "*Cooling Chilled Water tab*" > select "*Chilled Water Demand*" option> in top sentence OR in right hand box> select "*unit equivalent*" > dollars

Answer is also in the "*Today or Last 24 hrs button*" & scroll bar > select "*unit equivalent*" > dollars

Task 4. Which month of the year presented the highest demand for cooling (chilled water tons)?

Answer is found under "*Cooling Chilled Water tab*" > select "*Year tab*"> select "*Chilled Water Demand*" option

Task 5. Which day of the month was heating (demand for steamed water MMBtu/hr consumption highest so far this month?

Answer is found under "*Heating & Steam tab*" > select "*month*" tab> select "*Entire Bldg. Demand*" option>

Task 6. The following are unique energy conservation features present in the Human Ecology Building.

Answer is under "*Facts and Definicions*" tab at the bottom of the page> flip through the "book".

Task 7. Second floor plug load energy consumption was lowest at what time today?

Answer is under "*Total Energy*" tab at the bottom of the page> top left hand scroll bar

Answer is under "*Comparisons*" tab > set comparisons > click go

Task 8. In the space below, please describe what you believe the mission of this website is.

Variable answer. It is noted whether the conservation tip is read from the website.

Task 9. In the space below, identify one way this website would help you conserve energy.

Variable answer. It is noted whether the conservation tip is read from the website.

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